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PUBLIC SERVICE COMMISSION OF WISCONSIN  
GAS & ENERGY DIVISION

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# Commission Staff Draft Report on the Access Study Initiative



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GAS & ENERGY DIVISION

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## Docket 137-EI-100

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## Executive Summary

In the last 15 years dramatic changes have taken place at the state, regional, and federal levels that have affected the supply and delivery of electricity. The focus of those changes has been on increasing competition in the generation side of the electric utility business by promoting equal and open access to the transmission system. The Energy Policy Act of 1992, the development of the Midwest Independent Transmission System Operator and the creation of the American Transmission Company, LLC (ATC) are key events that have impacted Wisconsin. As a result of the focus on increased competition, Wisconsin's transmission system is being used differently than it was pre-1995 and in a way that it was not designed to easily accommodate. Greater flows of electricity through our transmission system test its adequacy and challenge not only its reliability but also its ability to access less costly electricity in the region.

With regard to these concerns ATC, to its credit, began its Access Study Initiative (ASI) in 2004. The ASI report filed in this docket is the culmination of a series of meetings with customers and other stakeholders to study the potential value of expanding the transmission system. Representative transmission projects were developed with the intention of determining which geographical direction might provide the greatest economic benefits to Wisconsin. With input from stakeholders, ATC settled on the five representative projects included in the ASI.

The purpose of this docket is to develop a record concerning the broad policy issues addressed by the Access Study Initiative.<sup>1</sup> The ATC filing is technical in nature. It is a study of representative projects in somewhat specific geographical locations. ATC used the engineering software PROMOD to perform cost-benefit and other analyses, and the results show expected performance for the individual projects. ATC also used a merit-scoring system for a variety of qualitative factors to rank the projects. The filing was accompanied by a request that the Commission allow ATC to further evaluate three of the representative projects and select one for filing of a Certificate of Public Convenience and Necessity (CPCN) application.<sup>2</sup>

ATC's report concludes that there would likely be significant economic benefits to Wisconsin by building a large transmission line to link up to other states in the region. Such a link might enable the Commission to reduce its planning reserve margin requirement from 18 percent to 15 percent, an action that, if there is no accompanying reduction in system reliability, could lower electricity costs. Planning reserve margins are a measure of system reliability. They are necessary in order to provide generation if actual load is greater than the load forecast, or in the event that not all generation is available at the time of system peak due to a variety of factors. ATC also stated that it believes construction of additional extra high voltage (EHV) lines would provide production cost savings (savings in energy costs) and other benefits for Wisconsin.

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<sup>1</sup> Notice Changing Docket from Investigation to Proceeding and Scheduling Order, mailed June 9, 2005.

<sup>2</sup> *Analysis and Comments of American Transmission Company*, pp. 23-24.

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Comments on the ASI essentially followed two points of view. One expressed agreement with the ASI that the transmission system is becoming more and more regional in nature and, given our state's few EHV links to the region, it would be an economic gamble not to increase regional transmission access, particularly given the long lead time it takes to construct an EHV line. Wisconsin's current unfavorable position in the regional electricity market is clear evidence that increased access must be pursued and must be started soon.

The other viewpoint urged caution. Given the uncertainties of claims of economic benefits, paying heed to other large scale plans to add EHV lines in the region, and considering the effects of generation and transmission projects that have been approved by the Commission and those that are currently being reviewed, further study is necessary before incurring the large cost and attendant environmental impacts that come with an EHV line.

Commission staff performed an analysis of the representative projects.<sup>3</sup> It concluded that a quantitative analysis of the projects suggests that it is quite possible there could be reliability and economic benefits to increased regional transmission access. However, a great deal of additional scrutiny is needed before concluding that the larger EHV lines should be immediately pursued. Uncertainties in construction plans in Wisconsin and the region beg further study. Present cost-benefit analyses are not persuasive. Collaborative analysis with other states could provide a valuable tool towards optimizing Wisconsin's transmission and generation system. Commission staff does believe there could be some appeal in pursuing the lower cost, smaller scale projects in the ASI that would provide the State with significant boosts in regional transmission access. Giving serious consideration to these smaller projects, while continuing to analyze the more ambitious projects, could be beneficial.

Commission staff's report is meant to provide information to the Commission as it considers policy direction on regional transmission access issues. ATC has commenced an important dialogue on these issues, and the screening approach it offered is an appropriate first step in determining the needs of the state.

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<sup>3</sup> See Appendix C.



# Chapter 1--Overview

## A. Introduction

This proceeding began in the 2004 Strategic Energy Assessment (SEA) which was the first SEA in which the Commission sought comment on a series of topical transmission planning-related questions. One of those questions concerned the appropriate amount of import transfer capability. Numerous stakeholders suggested the Commission adopt a policy of increasing import transfer capability; others suggested that further study be performed. As part of its 2004 SEA action plan, the Commission indicated it would open a proceeding exploring the appropriate simultaneous transfer capability for Wisconsin.<sup>4</sup>

During the past year, American Transmission Company, LLC (ATC) has examined increasing simultaneous import transfer capability, using a cost-benefit approach derived from sophisticated computer modeling of the electric system, and additional analysis of non-quantifiable factors. ATC was ordered to present this study to the Commission for public comment and Commission staff review. The list of projects is discussed below and technically analyzed in Chapter 2.

## B. Historical Context of ATC's Request and Study

Wisconsin consumers annually spend about \$5 billion on electricity. Summer peak electricity demand has grown between 1.7 and 2.2 percent annually during the past ten years.<sup>5</sup> For reliability reasons the Commission has approved numerous new generation projects during the past five years, some of which came on line this year. Major utility generation projects approved include 1,090 MW at Port Washington, 519 MW at Weston, 1,230 MW at Oak Creek, 150 MW on the UW-Madison campus, and approximately 2,300 MW of natural gas-fired projects located around the state. The Commission approved the first significant expansion of extra high voltage (EHV) in 2001 when it approved the 220 mile long 345 kV Arrowhead to Weston transmission line in order to address system reliability, security, and stability considerations. Construction on this line has commenced. A shorter 345 kV segment from Wempletown in Illinois to the Paddock substation near Beloit went into service this year. This segment has boosted electrical import capability into Wisconsin. An additional 100 miles of 345 kV transmission line in North Central Wisconsin is currently under review.

There has also been significant change in the regulation of the electric industry both at the state and federal levels. In 1978, Congress enacted the Public Utilities Regulatory Policy Act which required utilities for the first time to buy power from Independent Power Producers (IPP), the first step towards creating a wholesale power market. In 1992 Congress enacted the Energy Policy Act (EPA92) that established competition as the appropriate policy for wholesale power markets and created a new class of electricity provider called an exempt wholesale generator.

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<sup>4</sup> Page 146, Chapter 10, "Wisconsin's Strategic Energy Assessment – Energy 2010," Final Report, Docket 05-ES-102, September 2004

<sup>5</sup> Results compiled by the North American Electric Reliability Council and reported in the October 24, 2005, Electric Utility Week.

These laws formed the foundation for the Federal Energy Regulatory Commission (FERC) issuing two orders in 1996 (Orders 888 and 889) requiring non-discriminatory open access of the interstate transmission system and the posting of open access tariffs for such use. This policy change increased the usage of the transmission system and has resulted in more congestion.

At the state level the Governor, in 1997, issued a reliability directive to the Commission, utilities, and the legislature to ensure that an adequate, reliable, and cost effective supply of electricity would be available for Wisconsin consumers. This led to three important developments: (1) enactment of 1997 Wisconsin Act 204, making wholesale merchant power plants legal and streamlining the regulatory review process for new generation and transmission projects; (2) the establishment of the Wisconsin Reliability Assessment Organization (WRAO) by the utilities that issued a report in June 1999 calling for a new major EHV line to be constructed; five months later the Commission received an EHV application for the now approved Arrowhead to Weston project; and (3) passage of 1999 Act 9 allowing the formation of ATC as part of a further industry restructuring that would separate generation and transmission functions in an attempt to foster a more vibrant wholesale power market and create a renewable portfolio standard for Wisconsin utilities.

Policy changes continued in 2000 when FERC issued Order 2000 calling for the establishment of Regional Transmission Organizations (RTO) to control and operate the high voltage grid to foster enhanced system reliability and further encourage wholesale power market development. In 2001, Wisconsin utilities other than Northern States Power Company-Wisconsin (NSPW) officially transferred their transmission assets to the newly formed ATC in return for ownership and membership in ATC. Wisconsin utilities also were successful in 2002 in the official formation of the Midwest Independent Transmission System Operator (MISO) which the FERC eventually deemed an RTO under its Order 2000. Since 2002, the MISO has been responsible for transmission grid operation and reliability in the Midwest; ATC shares different components of this responsibility for its footprint and is also charged with the construction and maintenance of new and existing transmission projects. In terms of planning, MISO prepares an annual Midwest Transmission Expansion Plan (MTEP), which includes a detailed list of likely transmission additions through a forecasted five-year planning period. ATC also conducts planning using a longer ten-year horizon.

Recently, in April 2005, MISO began running a wholesale energy market in the Midwest for the purposes of centrally dispatching electric generation and setting price signals or locational marginal pricing (LMP) to manage system congestion. In August 2005 Congress enacted the Energy Policy Act of 2005 (EPA05) that further advances the goal of building competitive forces using a host of mechanisms. One of these mechanisms is that three or more states may join together to form a regional transmission planning and siting entity.

As the above discussion demonstrates, policy has been moving the electric industry towards regionalization and an increased use of competitive forces in the wholesale energy market. The costs and benefits of this policy change is the subject of vigorous ongoing debate. It has changed the usage of the transmission system throughout the country. It also has created a volatile and complex environment where expansion of the existing transmission system may be necessary to maintain system reliability, increase access to lower cost generation, or do both. ATC's initiative

fits into this context by essentially asking: Should Wisconsin expand its transmission system, and at what cost? Addressing these questions raises a series of challenging technical and policy issues. The following section highlights the essential elements of ATC's Access Initiative and reviews comments from a variety of stakeholders. A full technical discussion of ATC's initiative is contained in Chapter 2 and Appendices A through C.

### C. ATC's Filing and Intervener Comments

ATC performed a *screening-level* evaluation of five representative transmission projects, using the PROMOD production cost simulation model. The five projects are:

- South: a new Byron (Illinois)-North Monroe-West Middleton-North Madison 97 mile 345 kV line at an estimated cost of \$185.1 million.
- South: a new (second) Paddock-Rockdale 34.8 mile 345 kV circuit at an estimated cost of \$66.4 million.
- Southwest: a new Salem (Iowa)-Spring Green-West Middleton-North Madison 149 mile 345 kV line with a rebuild of Salem-Maquoketa 161 kV line at an estimated cost of \$351.3 million.
- West: a new Prairie Island (Minnesota)-Columbia 275.5 mile 345 kV line at an estimated cost of \$620.6 million.
- Lower-voltage: rebuilding the Lore-Turkey River-Cassville-Nelson Dewey 161 kV line at an estimated cost of \$14.7 million.

The factors considered in the evaluation included construction costs, projected reductions in energy costs, sensitivity analysis, system performance, and societal and environmental impacts. The evaluation also included an assessment of factors that cannot be monetized, such as risks, reliability, economic development, environmental benefits and costs, and fairness and equity aspects, using a multi-criteria analysis and merit scores.

ATC has requested that the Commission determine the following:<sup>6</sup>

1. that an EHV project that strengthens the ties of the Wisconsin transmission system to the regional grid is a timely and appropriate subject for development of a Certificate of Public Convenience and Necessity (CPCN) application, and
2. that it is acceptable for ATC to further evaluate the Paddock-Rockdale, Byron-North Madison, and Salem-North Madison options and to select one of these projects for filing of a CPCN application, subject to the requirement that ATC demonstrates in the CPCN proceeding that the selected project is consistent with the public interest, considering all of the factors in the CPCN statute.

Comments on ATC's study were filed by The International Brotherhood of Electrical Workers Local 2150; Customers First! Coalition; Municipal Electric Utilities of Wisconsin (MEUW); Wisconsin Electric Power Company (WEPCO); Dairyland Power Cooperative (DPC); Wisconsin Industrial Energy Group, Inc. (WIEG), Wisconsin Manufacturers & Commerce, Inc. (WMC), and Wisconsin Paper Council (WPC) (jointly); Madison Gas and Electric Company (MGE),

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<sup>6</sup> *Analysis and Comments of American Transmission Company*, p. 23-24.

Wisconsin Public Power Inc. (WPPI), Wisconsin Power and Light Company (WP&L), and Wisconsin Public Service Corporation (WPSC) (jointly); WP&L (individually); Citizens' Utility Board (CUB), Clean Wisconsin, and RENEW Wisconsin (collectively the joint public intervenors); and Peabody Energy Corp.

MGE, WPPI, WP&L, and WPSC support the Paddock-Rockdale project, and either the Byron-North Madison or Salem-North Madison line. They believe the projects will lead to lower costs for Wisconsin ratepayers, and provide a more level playing field for the state in terms of economic development. They also believe that the additional transmission will enable the state to reduce its planning reserve margin. MEUW also supports the filing of one or more CPCNs, but did not indicate a preferred project. All stated that the long lead time required for transmission projects requires immediate action.

DPC supports further evaluation of the Prairie Island-Columbia project. It believes that the costs will likely be shared by other states because the line will provide direct benefits to neighboring systems. Peabody Energy believes that, while ATC's representative projects will benefit Wisconsin consumers, more robust transmission options would fare better.

WIEG, WMC and WPC see insufficient evidence to support an assumption that lower cost energy and capacity will be available outside the ATC footprint in 2013. They, along with Customers First! Coalition and the Joint Public Interveners, see the need for a more integrated approach to resource planning that includes generation, transmission and energy conservation, for least-cost options.

WEPCO recommended information gathering for one year to better define the impacts of MISO Day-2. It supports more study on generation planning, and believes only cost effective projects should be pursued.

#### **D. Policy Context of ATC's Request and Study**

ATC has done a significant amount of technical analysis and qualitative evaluation. ATC appears to favor a new 345 kV transmission line from Salem, Iowa to North Madison or from Byron, Illinois to North Madison to achieve increased import capability access.<sup>7</sup> Technical analysis in Chapter 2 and the Appendices of this report suggests a rank ordering of the Lower Voltage option, followed by the Paddock to Rockdale 345 kV segment, and then perhaps the Byron, Illinois to North Madison project. Any of these projects could expand total transmission import capability. In 2013, the first contingency total transmission import capability would increase from 1,913 MW to 2,789 MW for the Paddock to Rockdale project, and to 3,342 MW for the Salem, Iowa to North Madison alternative.

There are several policy issues that must be considered when making a decision to expand the transmission system, as well as a large degree of subjective judgment. In addition, present analyses have not factored in potential new generation that may be sited in Wisconsin, results have not been optimized with other regional transmission developments such as the CapX

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<sup>7</sup> Page 22, ATC Reply Comments, October 13, 2005.

expansion plan being examined by Xcel Energy and other partners, and a robust analysis of environmental impact has not been performed.

The policy choices embedded in the ATC analysis the Commission could consider include:

- 1) Is there a need to increase the import transfer capability into Wisconsin?
- 2) Is reducing the planning reserve margin a prudent action?
- 3) Are the qualitative factors supporting the construction of new EHV a form of insurance that is worth the price?
- 4) Should the Commission take advantage of EPAct05 and seek a more regional planning and siting process?
- 5) Should the Commission ask MISO to expand its planning horizon to include Access alternatives and assess optimality?
- 6) What approach(es) will help to ensure that transmission construction and generation construction simultaneously provide low cost electricity to Wisconsin consumers?
- 7) Should the Commission encourage ATC, DPC, and Xcel and its partners to work more closely to develop an optimal outcome?
- 8) How will eventual FERC policy towards cost sharing for EHV lines that are either reliability or economics-oriented and reflected in MISO tariffs affect the choice of transmission project here in Wisconsin?
- 9) How does the Commission properly evaluate the tradeoff of siting perhaps more expensive generation closer to load centers in Wisconsin versus taking advantage of opportunities to buy cost effective short or long-term capacity and energy over an expanded transmission system that relies on generation plants located some distance from Wisconsin load centers but which carry some increased reliability risk?
- 10) Will any of the representative access transmission projects address system congestion and transmission constraints in Wisconsin?
- 11) How do potential generation projects in Wisconsin affect the Access alternatives?

These eleven questions are challenging, and as indicated earlier, occur in a dynamic federal and state electric industry restructuring context. New EHV may be needed in Wisconsin, but more facts, analysis and dialogue are necessary to ensure that the Commission can eventually make the choices that are clearly in the public interest.

## Chapter 2--Technical Analysis

### A. Introduction

ATC has raised important issues at a time when the electric market in Wisconsin and the Midwest is changing dramatically. The analysis in this chapter by Commission staff addresses the technical issues raised by ATC and its Access study as well as other factors in the comments received by stakeholders, some of which did not agree with ATC's conclusions. The goal of this report is to provide the Commission with additional analyses.

The analytical style of this chapter is observational. Commission staff has not performed or requested additional sophisticated computer model simulations. The analysis in this chapter adopts from economic theory that in any marketplace there can be gains to stakeholders from trade and gains from specialization. In that sense this chapter gives the ATC projects the benefit of the doubt that enhanced transmission access to regional wholesale markets will benefit Wisconsin stakeholders. This is also a testable hypothesis, which means that in assessing the merits of ATC's project alternatives, each should be scrutinized based on the facts at hand. Commission staff's analysis follows that mission.

### B. Procedural History

ATC began its Access Study Initiative (ASI) in 2004 with the stated objectives of providing greater access to low-cost energy resources outside of ATC's footprint, and improving the capability of ATC's transmission system to transfer energy within the ATC system. ATC held a series of meetings with its customers and stakeholders to discuss possible ASI project alternatives, solicit suggestions, and review the results of initial evaluations.

On February 14, 2005, the Commission issued a Notice of Investigation opening docket 137-EI-100 as a generic investigation into ATC's ASI, and directed ATC to file updated information on its ASI. On March 25, 2005, ATC filed updated information. On April 22, 2005, the Citizens' Utility Board (CUB), Clean Wisconsin, and RENEW Wisconsin, all interveners in this docket, filed comments on ATC's March 25, 2005, filing.

On June 9, 2005, the Commission issued a notice changing the docket from an investigation to an uncontested proceeding, and set a filing schedule. The filing schedule was subsequently modified in notices issued July 26, 2005, and August 29, 2005. The filing schedule required ATC to file updated information concerning its ASI, and included a timetable for interveners and the public to comment on the study and for ATC to reply to the comments. The notice also directed Commission staff to issue a draft report on the study, and allowed ATC, interveners and the public to comment on Commission staff's draft report.

On August 25, 2005, ATC filed four documents in this proceeding: (1) *2005 ATC Access Study Initiative Report*, (2) *Assessment of Other Factors: Benefit-Cost Analysis of Transmission*

*Expansion Plans, (3) Access Study Initiative Appendix, and (4) Analysis and Comments of American Transmission Company.*

On September 27, 2005, comments on ATC's study were filed by The International Brotherhood of Electrical Workers Local 2150; Customers First! Coalition; Municipal Electric Utilities of Wisconsin; WEPCO; DPC; WIEG, WMC, and WPC (jointly); MGE, WPPI, WP&L, and (WPSC) (jointly); WP&L (individually); CUB, Clean Wisconsin, and RENEW Wisconsin (collectively the joint public intervenors); and Peabody Energy Corp.

On October 13, 2005, ATC filed its reply to those comments.

### **C. Important Transmission Concepts**

Transmission planning in Wisconsin and nationwide began to change in the 1990s with changes in federal law and regulation. IPPs, retail access, independent transmission companies and RTOs were introduced. Transmission access was given to non-traditional entities. Wisconsin chose not to allow retail access, but did seek to foster wholesale competition by causing the formation of ATC in 2001.

At the same time, MISO was formed as an RTO. MISO manages about 120,000 megawatts (MW) of summer peak demand and about 120,000 miles of transmission over 15 states, including about 12,000 MW of summer demand and 12,000 miles of transmission in Wisconsin. Interspersed in Illinois and to the east, PJM, another RTO, manages about 120,000 MW of summer demand.

MISO manages the generation interconnection queue and oversees the need for transmission line placement for regional reliability and better wholesale market operation. MISO prepares an annual MTEP, which includes a detailed list of likely transmission additions over a forecasted five-year planning period. Some transmission owners, including ATC, have volunteered additional information on planned or provisional transmission additions beyond the five-year planning period. All planned additions included in the report have been determined by MISO to be justified. The report for 2005, MTEP05, also includes the status and preliminary information on exploratory projects beyond the last model year. Two such projects are the CapX 2020<sup>8</sup> Exploratory Study and the Iowa-Southern Minnesota Exploratory Study.<sup>9</sup> MISO is actively participating in the Iowa study.

Transmission additions to the MISO footprint should take into consideration certain criteria.

- The first is to follow the North American Electric Reliability Council (NERC) protocol for basic network reliability.
- The second is the generation interconnection requirements for the purposes of meeting fault, stability and thermal requirements. For MISO, this means that for Designated

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<sup>8</sup> CapX 2020 consists of Central Minnesota Municipal Power Agency, Great River Energy, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, Southern Minnesota Municipal Power Agency, and Excel Energy.

<sup>9</sup> The Iowa-Southern Minnesota Exploratory Study is an open and collaborative planning process with MISO staff, wind developers, wind advocates, utility planners, and state regulatory staff members in the stakeholder/study group.

Network Resources (DNR), the power can flow in any direction when all DNR generation in the area is running. It does not mean a Load Serving Entity (LSE) can be guaranteed unrestricted access at any time. This process has changed over the last two years. Previously, generation was dedicated to one or more LSEs in a specific area.

- The third is to provide service to all loads if one significant element of the generation or transmission system is out of service, a condition generally known as “*n-1*”. It may not be cost-effective to eliminate infrequent constraints of few hours and limited magnitude.
- The fourth is to ensure that Financial Transmission Rights (FTR) are available to hedge against *n-1* constraints. If there is not enough transmission, FTRs cannot be granted. Again, limited congestion may not be removed cost-effectively by large transmission lines.

Some transmission lines may provide both financial congestion relief and additional reliability. MISO has filed a Regional Expansion Criteria and Benefits (RECB) cost allocation methodology with FERC that could determine, among other things, the extent to which individual entities share in the benefit of certain MTEP projects, and to establish the allocation of costs to the beneficiaries across the MISO region. The cost allocation tariff has not yet been approved. At FERC the Public Service Commission of Wisconsin (PSCW) has filed significant objections to MISO’s preferred cost-sharing approach.

The new power market now operates in day-ahead and real-time, with FTRs instead of physical transmission rights. The generation is committed using a centralized dispatch system that checks for constraints. The entire physical system of generation and transmission is checked every five minutes to dispatch generators with the lowest bid price without potentially overloading any transmission line or transformer.

#### **D. Representative projects considered in the ASI Report**

The ASI report includes five representative projects that could be constructed to improve access to regional markets. These projects would not necessarily be needed solely on the basis of system reliability considerations. (*See* maps, Appendix A and B)

- South: a new Byron (Illinois)-North Monroe-West Middleton-North Madison 345 kV line.
- South: a new (second) Paddock-Rockdale 345 kV circuit.
- Southwest: a new Salem (Iowa)-Spring Green-West Middleton-North Madison 345 kV line with a rebuild of Salem-Maquoketa 161 kV line.
- West: a new Prairie Island (Minnesota)-Columbia 345 kV line.
- Lower-voltage: rebuilding the Lore-Turkey River-Cassville-Nelson Dewey 161 kV line.

#### **E. ATC Ten-Year Plan**

The ASI complements the ongoing ATC 10-Year Transmission Assessment. The current 10-Year Transmission Assessment includes several 345 kV lines that are independent of the EHV lines identified in the ASI. These include:



- Werner West to Morgan, planned and under PSCW review, with a target date of 2009.
- Garner Park to Central Wisconsin, planned and under PSCW review, with a target date of 2009.
- Rockdale to Bark River, proposed, with a target date of 2011.
- Rockdale to West Middleton, proposed, with a target date of 2011.
- West Middleton to North Madison, proposed, with a target date of 2014.

The Salem to North Madison 345 kV line is also included in the latest 10-Year Transmission Assessment.

In addition to the EHV lines identified above, the 10-Year Transmission Assessment includes lower voltage power line improvements and non-power line improvements to the core transmission infrastructure. ATC has undertaken over \$500 million in transmission improvements and the 10-Year Transmission Assessment identifies almost \$2.5 billion in additional transmission system improvements through 2015.

#### **F. Commission staff's comments on Methodology**

There is merit in the Access report's production cost benefits approach to evaluate the economic and financial costs and benefits of additional high voltage transmission facilities to serve Wisconsin. The ASI also raises important policy questions, which are complex, but in need of timely discussion and elaboration. However, Commission staff believes the report does not include enough information to commit, at this time, to any particular solution for EHV expansion. Some of Commission staff's concerns are:

- The financial analysis is a good screening technique but is not adequate for determining a commercially beneficial scenario for the ATC footprint.
- The ranking value techniques are too arbitrary for final determination.
- More sample years should be included in the analysis.
- The methodology did not evaluate any regional generation expansion scenarios, such as coal and wind to the West and coal to the South.
- If an LSE chooses to participate in generating plants out of state, it needs adequate FTRs to import the energy. FTRs can only be granted if enough transmission is located between the source (designated generator) and the sink (LSE load area). The ASI has not included likely new out-of-state designated network resources to load.
- The analysis included sensitivity studies of scenarios with uncontrollable outside events, such as higher natural gas prices, nuclear plant outages, etc. However the sensitivity events were not given any probability rating of occurrence and only one event in one direction was used. This analysis is not sufficiently robust.
- The *Assessment of Other Factors* does not include comprehensively designed, objective, integrated regional studies with respect to its environmental analyses.
- Possible addition of generation at Nelson Dewey, Columbia, or Weston was not examined.

## G. Observations

Commission staff offers the following observations on the ASI report, its associated materials, and the comments received from stakeholders in this docket.

1. Major new projects such as the Arrowhead to Weston line and the significant intra-Wisconsin transmission line improvements currently under way by ATC are expected to significantly reduce congestion and increase both import capabilities and total transfer capability into Wisconsin.
2. ATC, in its reply comments, looks at current congestion in all of Wisconsin as supporting documentation for a need for additional 345 kV transmission investments in the state.<sup>10</sup> However, over one-half of the hours of current congestion are along the western Wisconsin and Minnesota interface to the ATC footprint and in the far northeast Wisconsin and Upper Peninsula of Michigan area. Much of this congestion is expected to be alleviated with the Arrowhead to Weston 345 kV line in 2008 and with upgrades to the transmission system between northeastern Wisconsin and the Upper Peninsula that are under way or are being developed.
3. There are now four 345 kV transmission lines to the south of Wisconsin. The second Wempletown to Paddock line came into service this year. As noted by ATC in its reply comments, this new investment in high voltage transmission has had a real benefit in the ability to import power from the south.<sup>11</sup> It is difficult, however, to discern how much of the additional import capability this year is due to the improved transmission dispatch capability from MISO's ability to dispatch over a much larger footprint and how much is due to improved transmission capacity from improvements such as the second 345 kV circuit on the Wempletown to Paddock path.
4. ATC does take into account transmission improvements that are under way as well as known new generation in Wisconsin and in other states. However, it is very likely that additional generation, especially baseload generation, will be sited in Wisconsin before 2013. A third Elm Road Generation Station (ERGS) unit may be a crude proxy for additional generation in Wisconsin, but it remains imperative that ATC closely monitor additional generation activity of all kinds (baseload, wind, and peaking) and incorporate and update its analysis as necessary. In some respects generation and transmission may be substitutes in solving various needs issues to ensure reliable electric availability and quality for Wisconsin ratepayers.
5. As noted by ATC,<sup>12</sup> the intervening utilities,<sup>13</sup> and Peabody Coal,<sup>14</sup> there may be a comparative advantage to some types of generation in other states that may make it desirable for Wisconsin LSEs to acquire at least some of both capacity and energy from sources outside of Wisconsin. A long-term comparative advantage exists when there is cheaper generation in another state due to an ongoing inherent production advantage in

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<sup>10</sup> ATC reply comments, pp. 3-4.

<sup>11</sup> ATC reply comments, p. 10.

<sup>12</sup> ATC reply comments, pp 4-5.

<sup>13</sup> Joint comments of MGE, WPPI, WP&L, WPSC, pp 24-25, 27.

<sup>14</sup> Comments of Peabody Coal, p. 2.

that state. One example cited is mine-mouth coal-fired generation in Illinois that avoids the costs associated with the transportation of coal to a generating facility closer to load. Another example cited is a superior wind regime in Iowa, Minnesota, and the Dakotas. A short-term comparative advantage in generation may occur when there is underutilized capacity in another state where the capacity may be offered at a lower price to recover at least part of the investment costs by the owners. Examples cited include underutilized existing natural gas and coal capacity in Illinois.

Of the states bordering Wisconsin, only Illinois is and has been a major exporter of electricity.<sup>15</sup> Wisconsin's current interstate transmission connections to Illinois have been used to take advantage of lower priced energy and capacity in Illinois. The 2005 addition of the second 345 kV line between Wempletown and Paddock has increased the ability to import energy from Illinois and to improve electric reliability in the state by lowering the Loss of Load Expectation (LOLE). When completed in 2008, the Arrowhead to Weston 345 kV transmission line will also allow Wisconsin LSEs to import more power and will also improve electric reliability by lowering the LOLE.

6. In their comments, the Intervening Utilities describe the congestion that existed during the period from April to August 2005 in the MISO Day-2 Energy Market between pricing hubs outside of Wisconsin and the Wisconsin load zones. The Intervening Utilities use the existence of this congestion to justify the need for the Access alternatives and argue that the elimination of this congestion would provide benefits. This argument ignores the fact that several major transmission lines will be in service or, pending Commission approval, may be in service prior to 2013.<sup>16</sup> In addition, 2,554 MW of generating capacity is now under construction in Wisconsin.<sup>17</sup> The addition of these new 345 kV transmission lines and generating capacity will significantly reduce the congestion between Wisconsin and adjacent states. These additional transmission lines and generating capacity were included in ATC's analysis.
7. As noted by WEPCO, the portion of the economic value of a line that comes from importing lower cost electricity from other states depends, critically, on there being adequate sources of lower cost electricity at the other end of the line.<sup>18</sup> Illinois is the only major exporting state that abuts Wisconsin so, unless other known generation is forthcoming in another state, it is likely that transmission investments that improve transmission capacity between Wisconsin and Illinois will have a higher value when looking strictly at the value of importing electricity into Wisconsin.

Improved import capability between Wisconsin and Illinois may not be limited to investments in a new line between Wisconsin and Illinois. Transmission improvements in Iowa may also increase the capability of importing electricity from Illinois if those

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<sup>15</sup> Michigan is a minor exporter of electricity, but Wisconsin's interfacing border with Michigan is through the Upper Peninsula and this is not a likely path for electric imports into Wisconsin. Industrial intervenors raised this as a concern as well.

<sup>16</sup> The major 345 kV transmission lines not in service in 2005 which will likely be in service in 2013 include: Arrowhead-Weston (currently under construction), Morgan-Werner West (pending Commission approval), Rockdale-Lannon Junction, and West Middleton-Rockdale (currently in ATC's construction plans).

<sup>17</sup> The known additions to generating capacity not in service in 2005 which are now under construction and will be in service in 2014 include: Fox Energy Phase 2 – 260 MW, Port Washington Unit 1 – 545 MW (Unit 2 is in service), Weston 4 – 519 MW, Elm Road Unit 1 - 615 MW, Elm Road Unit 2 – 615 MW.

<sup>18</sup> Comments of WEPCO, p. 3.

- improvements eliminate n-1 contingencies, a check to ensure that the unexpected loss of one element in the transmission system does not overload any other element. The constraining element can occur in surrounding states and limit flows into Wisconsin. The low voltage option scenario identifies those constraints in 2013 and makes an economic case for possible construction.
8. The ATC analysis includes a line from Columbia to La Crosse to Prairie Island, Minnesota. However, a Prairie Island to Rochester, Minnesota to La Crosse line is under consideration by the Minnesota CapX 2020 transmission line study group. Commission staff asked ATC to provide additional information on a 345 kV line from La Crosse to Columbia that would tie into the CapX 2020 line if it were built. Tables 1, 2, and 3, below, replace ATC's longer Columbia to Prairie Island option with this shorter segment. This truncated option assumes that the Minnesota portion to La Crosse line is built independently of the ASI.
  9. ATC looks at both the economic benefits and the reliability benefits of a new transmission line. It appears that the economic benefits are derived from the production cost savings based on price differentials and gigawatt-hours (GWH) of additional energy that may be imported. This is a volume measure of the total energy imported into the ATC footprint. ATC estimates production cost savings using this approach at between \$8.5 million and \$10.6 million per year, depending upon the line. When these production cost savings are coupled with the annual capital carrying costs to estimate net savings, only the Paddock to Rockdale and the Low Voltage options show a clear economic benefit, as shown in Table 1. Even if the Prairie Island to Columbia line's costs are truncated to include only the La Crosse to Columbia segments—which assumes that the Prairie Island to La Crosse segments are built to serve other needs—this line does not show a positive annual net savings.

| <b>Table 1</b>                                     |                              |                      |                         |                         |                         |  |
|--|------------------------------|----------------------|-------------------------|-------------------------|-------------------------|--|
| <b>Economic Factors – Net Savings<sup>19</sup></b> |                              |                      |                         |                         |                         |  |
|  |                              | <b>Lower Voltage</b> | <b>Paddock-Rockdale</b> | <b>Salem-N. Madison</b> | <b>Byron-N. Madison</b> | <b>La Crosse-Columbia<sup>20</sup></b> |
| \$Million  | Estimated Cost of Package    | 33.0                 | 69.1                    | 352.3                   | 186.1                   | 337                                    |
| \$Million/year                                     | Annual Capital Carrying Cost | 2.6                  | 5.5                     | 27.9                    | 14.8                    | 27.5                                   |
| \$Million/year                                     | Average Market Savings       | 8.5                  | 9.0                     | 9.2                     | 10.6                    | 9.0                                    |
| \$Million/year                                     | Annual Net Savings           | 5.8                  | 3.5                     | -18.8                   | -4.2                    | -18.5                                  |

Another way of looking at the costs and benefits of the projects is to look at the expected GWH of additional energy imported into the ATC footprint compared to the cost of the project. The Lower Voltage option brings in additional energy at the lowest average cost,

<sup>19</sup> ASI report, Table 5, p. 16.

<sup>20</sup> Commission staff's scenario to tie in with CapX 2020. Numbers are based on ATC responses to staff data requests.

followed by the Paddock to Rockdale line, Byron to North Madison, La Crosse to Columbia and, finally, Salem to North Madison.

| <b>Table 2</b><br><b>Economic Factors - \$ per GWH<sup>19</sup></b> |                       |                              |  |
|---|-----------------------|------------------------------|--|
| <b>Line</b>   | <b>Estimated Cost</b> | <b>Estimated GWH Imports</b> | <b>Dollars per additional GWH of imports</b> |
| Lower Voltage   | \$33,000,000          | 524                          | \$63,000                                     |
| Paddock-Rockdale  | \$69,100,000          | 606                          | \$114,000                                    |
| Byron-N. Madison  | \$186,100,000         | 802                          | \$232,000                                    |
| La Crosse-Columbia <sup>20</sup>                                    | \$337,000,000         | 781                          | \$432,000                                    |
| Salem-N. Madison  | \$352,300,000         | 648                          | \$544,000                                    |

10. In the ASI report, four different measures of transfer capability, measured in megawatts, are used to assess the access benefits. This is an instantaneous capacity measure of import capability into the ATC footprint. The four measures are: Total Transfer Capability (TTC), First Contingency Total Transfer Capability (FCTTC), Highest PROMOD Import Level (HPIL), and Maximum Imports (MI).

| <b>Table 3</b><br><b>Reliability Factors</b> |                      |                         |                         |                         |                           |
|--|----------------------|-------------------------|-------------------------|-------------------------|---------------------------|
|  | <b>Lower Voltage</b> | <b>Paddock-Rockdale</b> | <b>Salem-N. Madison</b> | <b>Byron-N. Madison</b> | <b>La Crosse-Columbia</b> |
| Cost   | \$33,000,000         | \$69,100,000            | \$352,300,000           | \$186,100,000           | \$337,000,000             |
| TTC <sup>21</sup> (MW)                       | 4374.2               | 3628                    | 5344                    | 5359                    | 5250                      |
| \$/MW (rank)                                 | \$7,544 (1)          | \$19,046 (2)            | \$65,924 (5)            | \$34,727 (3)            | \$64,190 (4)              |
| FCTTC <sup>22</sup> (MW)                     | 3166                 | 2789                    | 3342                    | 3094                    | 3118                      |
| \$/MW (rank)                                 | \$10,423 (1)         | \$24,776 (2)            | \$105,416 (4)           | \$60,149 (3)            | \$108,082 (5)             |
| HPIL <sup>22</sup> (MW)                      | 3740                 | 3871                    | 3609                    | 3907                    | 3916                      |
| \$/MW (rank)                                 | \$8,800 (1)          | \$17,900 (2)            | \$97,600 (5)            | \$47,600 (3)            | \$86,100 (4)              |
| MI <sup>22</sup> (MW)                        | 4747                 | 4996                    | 4960                    | 5101                    | 5189                      |
| \$/MW (rank)                                 | \$6,952 (1)          | \$13,831 (2)            | \$71,028 (5)            | \$36,483(3)             | \$64,945 (4)              |

In all cases, looking only at the dollars, the Lower Voltage option has the lowest cost per MW in all four measures of transfer capability. The Paddock to Rockdale line consistently comes in second, followed by the Byron to North Madison line. The La Crosse to Columbia line comes in fourth on four of the measures and fifth on one measure. The Salem to North Madison line comes in fifth on four of the measures and fourth on one measure.

<sup>21</sup> ASI report, Table 8, p. 21.

<sup>22</sup> ASI report, Table 15, p. 33.

11. It is noteworthy that the five lines' measures of transfer capability and GWH of imports are not additive. If the Lower Voltage option were to be completed and then one of the other lines were to be built, the additional line would not necessarily lead to commensurate increases in either transfer capability or in GWH of imports. At this point, the options should be viewed as discrete options. Additional analysis is required to determine the combined transfer capability and import potential from a coupling of options.
12. ATC performed analyses to determine which projects are required to support up to 5,000 MW of import capability.<sup>23</sup> The solution included lower voltage lines or transformers in Wisconsin, and substation configuration changes in Illinois. This suggests that, regardless of the next major 345 kV project, there are numerous complementary projects that could improve transfer capability without large capital expenditures.
13. The cost of incremental transmission requirements for new 1,000 MW-plus generation plant sites typically accounts for less than 10 percent of the total capital costs of the generation facilities;<sup>24</sup> therefore it is the generation that is the cost driver and not the transmission. Coal generation site location is driven by coal delivery and water and emission limits. Wind generation is sited by wind energy density maps and compatible-use topography. It is the generation interconnection requirements that determine the transmission requirements. It may not be appropriate to eliminate all economic congestion with transmission additions. Transmission planning should address the elimination of only the largest and most frequent economic flow impediments.
14. No new generation expansion scenarios<sup>25</sup> were linked to ATC's transmission scenarios. ATC is an independent company and can not direct or favor generation placement for generator owners or individual LSEs in its footprint. However, after some level of internal planning development, coordinated transmission expansion studies with other transmission owners are appropriate before a commitment to area construction.
15. Both the CapX 2020 Exploratory Study and the Iowa-Southern Minnesota Exploratory Study determined that Prairie Island in Minnesota and Salem in Iowa were likely interface substations. The ASI report has the same conclusion. The CapX study did not focus on the associated lower voltage projects necessary to make each generation scenario have the minimal amount of congestion. One of the next steps planned for CapX is to analyze the lower voltage systems for voltage violations and thermal overloads for contingency analysis. The Iowa study is continuing to investigate with MISO the generation interconnections, hourly market operations, and economic congestion issues. Each of the exploratory studies has lines terminating in south central Wisconsin. The number of EHV lines depends on the amount and location of generation.
16. The EPAct05 allows multiple states to form a collaborative for the purpose of siting interstate transmission facilities. This is a possibility that could be considered in one or more combinations for the states of Wisconsin, the Dakotas, Minnesota, Iowa, and

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<sup>23</sup> ASI report, pp. 18-22.

<sup>24</sup> Cost ratios of generation plant to transmission were taken from the Elm Road Generating Station Final Environmental Impact Statement, Volume 1, pp. 12, 15, 74, and 75.

<sup>25</sup> ATC did perform a sensitivity analysis with a third Elm Road unit.

Illinois. The long-range plans of this sub-region of MISO could have a common planned set of interfaces to reduce future costs while increasing benefits and mitigating impacts. With respect to the Access projects, any terminus outside of the state of Wisconsin would require the cooperation of the siting and permitting agencies of the neighboring state(s).

## **H. Value of Qualitative Factors**

The Intervening Utilities have suggested several non-quantitative factors to support the construction of additional EHV lines into Wisconsin by ATC. This group of stakeholders believes that ATC's production cost savings underestimate potential benefits because the modeling cannot possibly factor in the full value of additional EHV into Wisconsin.

Among the qualitative factors cited is the concept that Wisconsin LSEs have lost opportunities to save ratepayers money due to ongoing transmission congestion and an under built EHV system that does not allow sufficient economical electrical imports on either a short- or long-run basis. Such lost opportunities involve potential transactions with partners in Illinois with current excess capacity, capturing energy from new renewable wind energy projects being designed to the west of Wisconsin, and capacity and energy from potential coal projects in Illinois and the Dakotas.

Other potential benefits cited include improved maintenance scheduling, leveraging fuel transportation costs by playing railroad shipping costs off of mine-mouth coal plants that require only transmission access, reducing the risk from localized natural gas shortages or pressure issues, and improved system reliability.

Commission staff agrees that expanded EHV capability might bring about some of the above items and could benefit ratepayers. However, there is no way to precisely capture that value numerically or to determine how long the benefits might last. To address these issues, Commission staff has inflated the potential savings by a factor of four to provide an extreme upper bound to the value of the qualitative factors. Commission staff believes that there may be larger benefits in the short run, but ATC's production cost benefits continue to be the best long run estimate of potential savings.

These inflated benefits estimates as well as ATC's original savings' estimates, are used in the dynamic revenue requirement analysis of Appendix C and in the following section which summarizes the Appendix C analysis. Those analyses examine the timing of when ratepayers break even under a variety of assumptions for ATC's suggested EHV projects.

## **I. Dynamic 2006-2053 Revenue Requirement Analysis**

Annual revenue requirements are folded into the rates that ATC passes on to ratepayers in Wisconsin. The annual revenue requirements take into consideration when the cost of financing the construction of the facility must be paid. The economic robustness of a new transmission line can be gauged by comparing the annual revenue requirements to the annual production cost savings. That comparison will indicate when the annual production cost savings begin to surpass the annual revenue requirements, and when the line breaks even for ratepayers—that is, when the discounted cumulative stream of benefits begin to exceed the discounted cumulative annual revenue requirements. The ASI did not include this type of analysis.

Commission staff performed the revenue requirement and annual production costs savings sensitivities for the proposed Paddock to Rockdale, Byron to North Madison, and Salem to North Madison lines.<sup>26</sup> The analysis is shown in Appendix C. The analysis was not performed for the Columbia to La Crosse/Columbia to Prairie Island line because the annual revenue requirement on this line would greatly depend upon whether the line ends in La Crosse or Prairie Island. Based on the production cost savings provided by ATC in its report, the annual revenue requirements on a line all the way from Columbia to Prairie Island would exceed even the most optimistic of the scenarios performed in the analysis.

The analysis was also not performed for the Lower Voltage scenario. This scenario has production cost savings similar to the Paddock to Rockdale line but has a much lower capital cost, so the expected break even points would be no later than the expected break even points on the proposed Paddock to Rockdale line.

The Intervening Utilities and ATC have suggested that with additional import capabilities the Commission could reduce the planning reserve margin from 18 to 15 percent. Reducing the reserve margin is not a trivial issue, as discussed later in this report. However, Commission staff added the potential savings to ratepayers from a reduced planning reserve margin as a sensitivity in its analysis, coupling these savings with the ATC production cost savings.

The Intervening Utilities suggested that ATC's production cost savings are too conservative. They note current disparities in prices between the Wisconsin Upper Michigan System (WUMS) and other MISO price nodes and higher congestion charges within WUMS than in the full MISO footprint. While those price differences are currently observed, the Commission has authorized construction of new generation and significant new transmission infrastructure to address these issues. Commission staff does not believe these price differences and congestion charges will last indefinitely. However, staff quadrupled ATC production cost savings to approximate the cost savings indicated by the Intervening Utilities as a sensitivity in its analysis.

The results of Commission staff's analysis for the Paddock to Rockdale, Byron to North Madison and Salem to North Madison lines are presented in Tables 4, 5, and 6, below.

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<sup>26</sup> ATC provided the annual revenue requirements for all of its proposed the lines in response to Commission staff's data request.



| <b>Table 4</b><br><b>Sensitivity Analysis on Paddock to Rockdale</b>       |  |  |
|--|--|--|
| <b>Scenario</b>  | <b>Year when benefits first exceed annual revenue requirements</b> | <b>Year benefits begin to exceed annual revenue requirements (cumulative discounted)</b> |
| ATC Production Cost Savings  | 2016   | 2025   |
| Lower Reserve Requirement and ATC Production Cost Savings                  | 2013   | 2013   |
| Keep Current Reserve Requirement and Quadruple ATC Production Cost Savings | 2013   | 2013   |
| Lower Reserve Requirement and Quadruple ATC Production Cost Savings        | 2013   | 2013   |

The break even analysis for the Paddock to Rockdale line shows a benefit to ratepayers in virtually all scenarios.

| <b>Table 5</b><br><b>Sensitivity Analysis on Byron to North Madison</b>    |  |  |
|--|--|--|
| <b>Scenario</b>  | <b>Year when benefits first exceed annual revenue requirements</b> | <b>Year benefits begin to exceed annual revenue requirements (cumulative discounted)</b> |
| ATC Production Cost Savings  | 2028   | After 2053   |
| Lower Reserve Requirement and ATC Production Cost Savings                  | 2013   | 2015   |
| Keep Current Reserve Requirement and Quadruple ATC Production Cost Savings | 2013   | 2014   |
| Lower Reserve Requirement and Quadruple ATC Production Cost Savings        | 2013   | 2013   |

The break even analysis for the Byron to North Madison line does not show a strong benefit to ratepayers unless production cost savings are quadrupled or the planning reserve requirement is lowered to 15 percent, or both.

| <b>Table 6</b><br><b>Sensitivity Analysis on Salem to North Madison</b>    |  |  |
|--|--|--|
| <b>Scenario</b>  | <b>Year when benefits first exceed annual revenue requirements</b> | <b>Year benefits begin to exceed annual revenue requirements (cumulative discounted)</b> |
| ATC Production Cost Savings  | 2043   | Never  |
| Lower Reserve Requirement and ATC Production Cost Savings                  | 2022   | 2047   |
| Keep Current Reserve Requirement and Quadruple ATC Production Cost Savings | 2021   | 2038   |
| Lower Reserve Requirement and Quadruple ATC Production Cost Savings        | 2013   | 2017   |

The break even analysis for the Salem to North Madison line does not show a strong benefit to ratepayers unless production cost savings are quadrupled and the planning reserve requirement is lowered to 15 percent.

## **J. Planning Reserve Margin**

The PSCW currently requires load serving entities in the ATC footprint to maintain an 18 percent planning reserve margin for each upcoming summer season. Planning reserves are generation resources and contracted purchased power over and above the capacity needed to meet a utility's forecasted peak summer load. Planning reserves are necessary in order to provide generation if actual load is greater than the load forecast. They also account for the possibility that not all generation will be available at the time of system peak due to forced outages (mechanical problems), the potential unavailability of fuel, the potential lack of hydropower due to drought, and other factors which may limit the output of certain generating units.

Planning reserve margin is a shorthand measure of system reliability. System reliability is typically analyzed using a probability assessment known as LOLE. The standard LOLE criterion for system reliability is that generation reserves should be sufficient such that load will exceed available generation resources no more often than one day in any ten-year period. The results of an LOLE analysis are translated into a planning reserve margin.

The ASI posits that addition of new Access facilities could make it possible for the Commission to reduce the 18 percent planning reserve requirement. ATC estimates that each 1 percent reduction in reserve margin would reduce utility revenue requirements in the ATC footprint by approximately \$8.1 million per year.<sup>27</sup> This estimate appears to be reasonable.

ATC forecasts a peak load in 2013 of 15,426 MW.<sup>28</sup> An 18 percent reserve margin would be approximately 2,776 MW. A 15 percent reserve margin would be approximately 2,313 MW, a difference of 462 MW.

Table 10 of the ASI Report shows that using the ATC assumptions for planned generation additions will result in a reserve margin of generation resources within the ATC footprint of 1,775 MW (Line 1 – Line 2), or 11 percent. Given these internal generating resources, the ASI Report states that its import capability into the ATC footprint will have to be at least 1450 MW in order to meet the LOLE reliability criteria.<sup>29</sup>

However, Column 3 of Table 10, “Base Case with Total Simultaneous Import Capability” shows 2013 import capability of 1,913 MW, which exceeds the 1,450 MW import capability necessary to meet the LOLE requirement by 463 MW. This is virtually the same as the amount of import capability necessary to reduce the planning reserve margin to 15 percent. Therefore, the ATC analysis appears to show that planned generation additions and planned transmission system improvements could allow for a reduction in the planning reserve requirement from 18 percent to 15 percent without the addition of any of the Access facilities. To the extent this is the case, results in Tables 4 through 6 of this report that do not lower the planning reserve are likely better indicators of break even savings for ratepayers.

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<sup>27</sup> This estimate is based on a levelized cost of peaking capacity of \$54.03 and a 2013 peak load of 15,426 MW.

<sup>28</sup> See ATC response to PSCW Staff Data Request 1.8. It should be noted that this is different from the 16,005 net load forecast shown in Table 10 of the ASI report.

<sup>29</sup> ATC Report at p. 25.

It is possible that the addition of Access facilities and the consequent increase of the associated simultaneous transfer capability could reduce the need to locate generation within the ATC footprint in order to meet the LOLE reliability criterion. However, this would require further analysis.<sup>30</sup>

## K. Environmental Review

An environmental review is part of a thorough integrated<sup>31</sup> analysis of need, economic impact, and engineering factors. These analyses should objectively consider a wide range of options that include both transmission construction and non-transmission solutions. In light of the changes that have occurred in the electric industry over the last ten years, these analyses need to integrate regional as well as local factors into the overall study. Such studies, if properly conducted, would uncover opportunities and synergies within a region and would reduce the likelihood of building duplicative or underused facilities. Because environmental reviews first seek to avoid impacts whenever and wherever possible, the integrated review described above is essential to assure that proposed lines are used and useful.

**Societal Impacts.** A limited environmental review can be found in ATC’s Assessment of Other Factors: Benefit-Cost Analysis of Transmission Expansion Plans. The analysis of societal impacts attempts to rank five system options according to the miles of new right-of-way (ROW) required for each option.<sup>32</sup> In this table, two transmission options stand out as examples of the extremes. Salem-North Madison receives a very favorable merit score of 9.6 with a presumed new ROW requirement of 6 miles and Prairie Island-Columbia receives a very unfavorable merit score of 0 with a presumed new ROW requirement of 159 miles. Taken at face value, the scores suggest an enormous difference in potential impacts between the two lines. However, these numbers may be misleading.

The scores are based solely on the presumed number of miles of new ROW required for each option. This factor, by itself, is not an adequate measure of societal impact. The report does not clearly define what is meant by new ROW, so it is uncertain exactly what is being measured. The definition of new ROW used by the report’s authors is “[I]and required to construct new transmission facilities where no existing transmission facilities or transmission ROW currently exist.”<sup>33</sup> This definition and the subsequent analysis ignore the need to expand existing transmission ROW in order to build plan options. The definition also discounts corridor sharing with existing transportation corridors, one of the stated priorities for transmission construction under Wis. Stat. § 1.12(6).

Table 11 of ATC’s report reports only six miles of new ROW for the Salem-North Madison option. However, the existing 138 kV line from the Nelson Dewey Power Plant to Spring Green

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<sup>30</sup> The North American Reliability Council approved Reliability First Corporation (RFC) as the newest regional reliability council. The RFC proposes a resource adequacy criterion of one day in ten years LOLE for an LSE or collection of LSE’s to be known as a Planning Reserve Sharing Group. It would allow for different reserves depending on an area’s generation mix, transmission access, renewable portfolio, demand response, and demand-side management, and would be enforceable per EPC Act 2005.

<sup>31</sup> An integrated approach models local and regional factors and incorporates with its transmission analysis a view of the most likely future generation environment as well.

<sup>32</sup> ATC Assessment of Other Factors, Table 11, p. 25.

<sup>33</sup> Definition supplied by ATC pursuant to PSC data request 1.12A

(approximately 60 miles long) would need to be expanded over its entire length to accommodate a new double circuit line.<sup>34</sup> From Spring Green to West Middleton (approximately 29 miles) the existing 69 kV transmission line would be rebuilt as a double circuit 138/345 kV transmission line. This would require a significant expansion of the existing ROW, perhaps a doubling of the ROW width, and would very likely require several 345 kV reroutes as the 69 kV line “stops off” at a number of small communities before reaching the North Madison Substation. This would result in a considerable amount of expanded and thus new ROW for that option. On the other side of the spectrum, Prairie Island to Columbia is shown to require 159 miles of new ROW. However, a La Crosse to Columbia line that connects to the CapX 2020 345 kV would be about 100 miles long and could potentially share ROW with existing transmission lines and Interstate Highways 90 and 94 for virtually the entire distance. The analysis of societal impacts found in the access plan does not fairly assess the relative potential impacts of the proposed plan options.

**Environmental Externalities.**<sup>35</sup> The report describes two analytical approaches to assess environmental externalities. However, neither methodology is used. The stated reason for this is that specific routes are unknown. However, in the preceding section the authors were able to calculate and score the presumed number of miles of new ROW required for each option. It is unclear why the stated routes are specific enough to calculate results for one purpose but not the other.

The analysis used consists of a simple listing of the names of resources potentially affected and a table that identifies affected land areas as a percentage of the total. However, since there is no indication of how many acres of impact are associated with each percentage, the analysis is of little value. A better estimate of the relative potential for environmental impact is attainable using established analytical methods.<sup>36</sup>

**Access to Wind Energy.** In the context of the ASI report, the benefit of transmission line options meant to gain access to wind energy is largely an engineering and cost issue. However, there are environmental implications. While wind energy is valued because of benefits associated with moderating global warming and reduced air emissions, environmental impacts associated with wind farm facilities are often ignored or discounted. The plan does not address the extent to which access to wind energy is primarily economically constrained as opposed to physically constrained. Payment of congestion costs may be a straightforward and reasonable way to gain access to wind power while avoiding the environmental, construction, and maintenance cost impacts associated with construction of new transmission assets. Energy from wind farms is likely to remain a relatively small component of the nation’s and region’s generation fleet, so there is little chance that the energy from those facilities will go unused. In other words, the environmental benefit will likely be realized within and throughout the region regardless of the plan options proposed.

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<sup>34</sup> Response to PSCW data request 1.12B.c.

<sup>35</sup> ATC Assessment of Other Factors, pp. 25-27, Table 12.

<sup>36</sup> An appropriate methodology would be to use GIS technology and geographic databases of statewide natural resources to estimate the amount and type of resources potentially affected by the construction of any of the plan options. Such an analysis would be based on the presumed routes used in the report’s determination of societal impacts.

## **L. Southern Wisconsin Generation Studies**

Two Feasibility Studies for large baseload coal plants were posted on the MISO interconnection queue in early October, after the filing of ATC's ASI. The studies cover a 280 MW plant at the Nelson Dewey substation and a 550 MW plant at the Columbia Substation. The requested in service date is 2011 for both units. A feasibility study only addresses steady-state thermal and voltage impacts of a new generation source under NERC design standards. It does not address short-circuit, transient, dynamic stability, and deliverability impacts and design requirements. Those design issues would be covered in MISO's Interconnection System Impact Study (ISIS) if the applicant pursues the project further.

**Nelson Dewey Power Plant.** According to the feasibility study, the injection of 280 MW at the Nelson Dewey 161 kV or 138 kV bus would cause thermal overloads on up to five different transmission system elements in the immediate area. This could be resolved by the addition of a 161/138 kV transformer and the installation of a larger conductor on a short 161 kV line, and changing out some substation equipment.

However, when considering the deliverability to the market, there are additional limits. If any one of 16 different 161 kV, 138 kV, or 69 kV area transmission elements is out of service for maintenance or forced outages, the plant output must be reduced to preserve system integrity. Twelve of the line situations would require the plant to shut down. This indicates a severe congestion and deliverability issue without the addition of significant transmission improvements in the area. How a new Nelson Dewey generating plant would affect Access project selection is unknown.

**Columbia Power Plant.** The feasibility study covers an injection of 550 MW at the 345 kV level at Columbia. The study found ten NERC thermal violations, five of which would require mitigation. Potential solutions for these identified violations include the replacement of the Columbia to Portage 138 kV Circuits 1 and 2, and all three Columbia 345 kV/138 transformers to increase the capacity of these facilities.

When considering operating restrictions for deliverability, planned or forced outages of 14 different transmission elements would require reduction in output of the unit to preserve system integrity, 13 of which would basically require the unit to be shut down. The solutions to these deliverability issues would be completed in the ISIS if this generating plant is pursued further. Again, how a Columbia project affects Access project selection is unknown.

## **M. Conclusions**

1. It is premature to select any particular line(s) or to dismiss any line from consideration. While the Lower Voltage option appears to be the most meritorious at this point, further analysis on where new generation is likely, both in Wisconsin and outside of Wisconsin, is needed. Commission staff is aware of additional generation proposals in Wisconsin and Illinois that are intended to serve Wisconsin load. If these new generation proposals move forward, additional analysis is needed in order to understand how this additional generation will affect the transmission system and the need for imports.

2. Given the dollar magnitude of the long interstate 345 kV lines for economic benefits, a more robust analysis using probabilistic techniques for costs, impacts and benefits should be employed. A commitment to over \$300 million in the fall of 2005 is not justified by the ASI.
3. It appears unlikely that any of the lines proposed in the ASI will have much effect on chronic transmission limitations in northeastern Wisconsin. The Arrowhead to Weston transmission line is expected to reduce transmission congestion in northern and northwestern Wisconsin. Current congestion in these areas does not appear to support the investments in transmission cited in the Access report.
4. Generation and transmission investments are too expensive and too long lived for the transmission owners not to cooperatively perform joint needs assessments and assure the lowest cost for the ratepayers. The proposals from the various transmission assessments of which Commission staff is aware suggest the potential for overinvestment in transmission infrastructure if a joint assessment of needs is not completed. EPAct 2005 allows states to form collaboratives for the purpose of siting interstate transmission facilities. MISO and the Organization of Midwest States (OMS) have forums and work groups that address regional issues. A multi-level effort by transmission owners, MISO, MISO stakeholders and regulators may help avoid overbuilding transmission and generation in Wisconsin, and reduce overall energy costs in the state.
5. The assessment of societal impacts and environmental externalities in the *Assessment of Other Factors* is preliminary. Societal factors should include more than an estimate of new ROW required (i.e. amount of private vs. public land needed, number of river crossings, positive and negative impacts to local communities etc.), and the definition of new ROW should be expanded to reflect the degree of difficulty in siting a transmission line, even when using existing routes.
6. With respect to the EHV scenarios, the Paddock-Rockdale alternative passes cost-benefit analysis more easily than the other alternatives, followed by the Byron to N. Madison line. However, as noted throughout this report, Access transmission lines to outside of ATC's footprint involve a complex analysis, covering numerous stakeholders with different strategic visions for generation and transmission. The world in which generation is dispatched and transmission is planned is also significantly changing at the present time. It is quite possible that Wisconsin will need additional EHV lines for both reliability and access purposes, but at present the Commission lacks sufficient information to make a least cost choice, especially given the important regional aspect to the selection of any EHV line.

The Intervening Utilities are clearly correct when they say “predicting the value of new [EHV] transmission ... is devilishly difficult.”<sup>37</sup> WEPCO and the industrial partners have shown reluctance as well. The Paddock to Rockdale EHV line scores well considering that possible generation additions at Nelson Dewey, Columbia, or Weston were not factored into the ATC study. For EHV lines going west or southwest, however, the uncertainty is large. The numerical analyses show that, under most scenarios, a ratepayer benefit occurs only after significant time has

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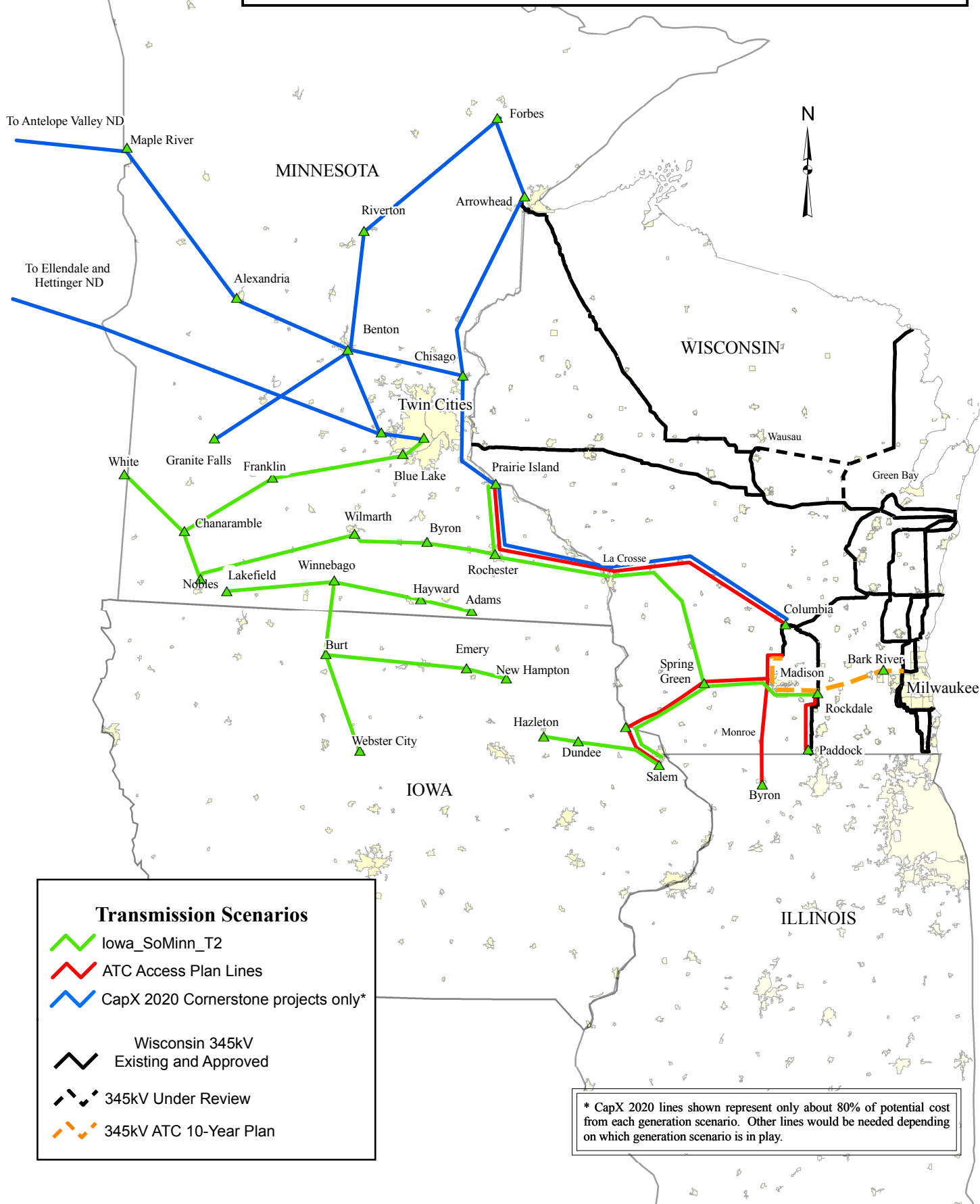
<sup>37</sup> Page 7, Intervening Utilities' Comments, September 27, 2005.

elapsed or if the Commission adopts aggressive policy stances towards lowering the planning reserve margin or increasing the importance of other qualitative factors. With additional modeling of perhaps a Nelson Dewey facility, the Salem to North Madison line could make sense not only from an Access perspective but a system security one as well. If larger amounts of Iowa wind are to be sunk in Wisconsin, the Salem line may also fare well. If a new generation unit is placed at Columbia, or if coal and wind are developed in the Dakotas, Minnesota and Iowa, a path from Columbia to La Crosse, the termination point for one of the proposed CapX 2020 projects, could make sense. A line to Byron could have economic and reliability advantages if large amounts of mine mouth coal were developed in Illinois. The Byron terminal is more robust than Salem, with four 345 kV lines, two nuclear plants and links in three directions.

The policy questions posed in Chapter One may help guide future investment in the state's transmission and generation infrastructure. More facts, analysis, and dialogue can help to ensure that the Commission can make the choices that are clearly in the public interest.

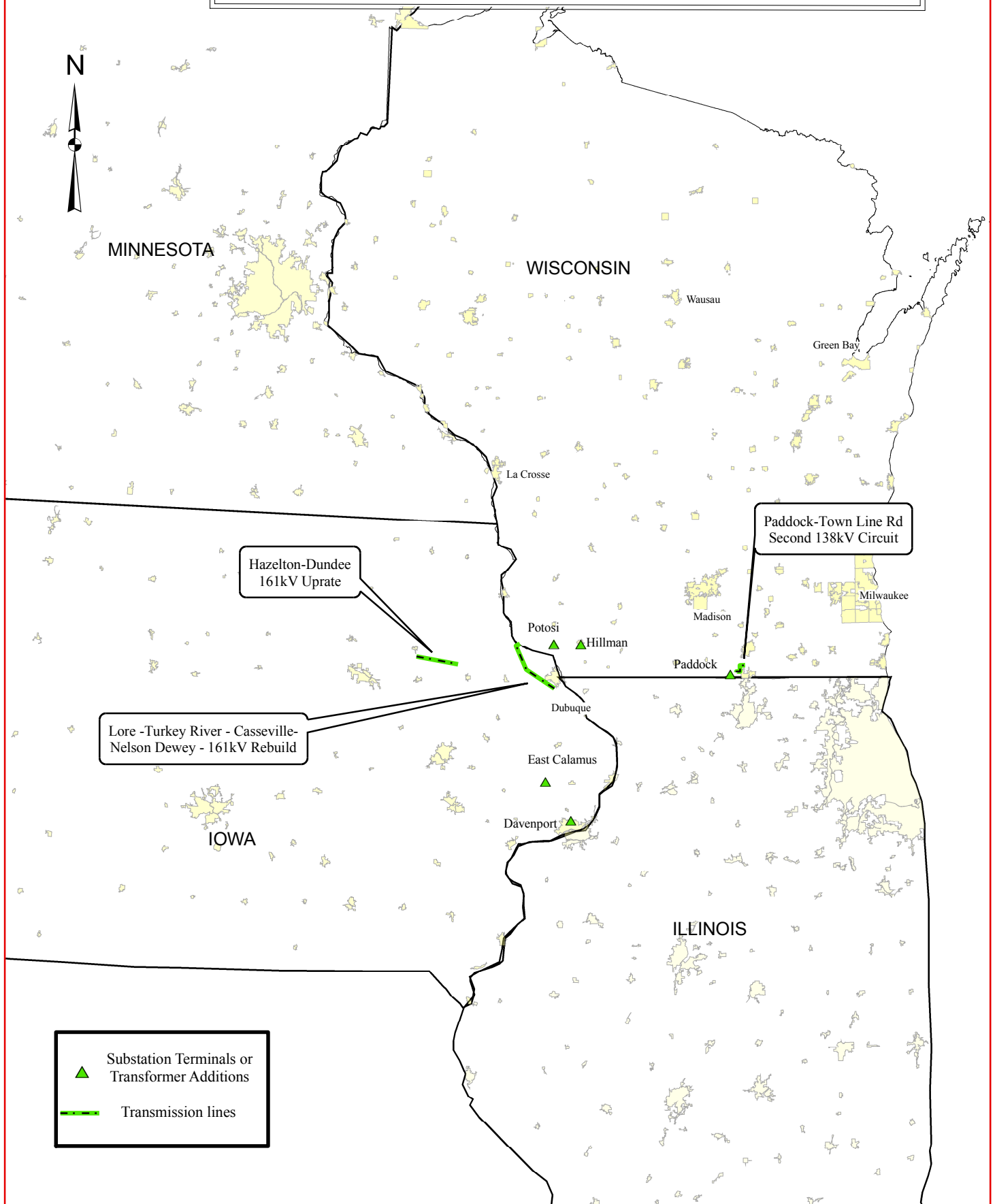
# Appendix A

## TRANSMISSION PLANNING SCENARIOS UPPER MIDWEST - Fall 2005





# Low Voltage Option



## **Dynamic 2006-2053 Cost-Benefit Revenue Requirement Analyses of the EHV Access Alternatives**

In this proceeding, WEPCO, the LSE for approximately half of the statewide electric demand, has raised objections to going forward with the Byron or Salem to North Madison alternatives.<sup>1</sup> The other retail utilities are more open to these alternatives,<sup>2</sup> with WP&L being more in favor of the Salem route.<sup>3</sup> A group of industrial interests has expressed reservations.<sup>4</sup> The Joint Public Intervenor wants the Commission to undertake a more robust planning process, using sensitivity analyses and a collaborative approach because crucial information to make an informed decision is still missing.<sup>5</sup> ATC appears to favor the Salem to North Madison line.<sup>6</sup> This vigorous debate is in need of quantitative fact finding, particularly a dynamic cost-benefit analysis. The following analysis attempts to place the debate in a numerical perspective for the Commission.

### **Salem to North Madison:**

ATC has indicated that the overnight construction cost of the Salem to North Madison line is \$352.3 million in 2005 dollars.<sup>7</sup> ATC indicates that the annual carrying charge rate for the line would be 8.11 percent.<sup>8</sup> This means that the levelized annual cost for the line would be \$28.57 million.<sup>9</sup> ATC has run its production cost model, PROMOD, to estimate the production cost savings of having such a line in operation in 2013. The estimated savings in 2005 dollars is \$9.2 million dollars.<sup>10</sup> These two results together suggest that the Salem to North Madison line would be a net loss for Wisconsin ratepayers by \$19.37 million dollars, calculated by taking the \$28.57 million estimate of carrying costs minus \$9.2 million in production cost savings. *See* Table A-1. These values are measured in 2005 dollars.

In addition, ATC and the Intervening Utilities have suggested that the Commission reduce from 18 percent to 15 percent its long-standing reliability policy for planning reserve margin.<sup>11</sup> This would mean LSEs would not carry as much additional capacity. The ramifications of such a policy change are discussed elsewhere in this report. ATC estimates the savings of reducing the

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<sup>1</sup> WEPCO has indicated only the Low Voltage and Paddock-Rockdale lines pass the cost-benefit test. Page 4, WEPCO comments, September 27, 2005.

<sup>2</sup> Intervening Utilities' (MGE, WPPI, WP&L, and WPSC) Comments, p. 32, September 27, 2005. MEUW takes a similar view.

<sup>3</sup> WP&L Supplemental Comments, p. 6, September 27, 2005.

<sup>4</sup> WIEG, WPC, and WMC are not convinced there will be "lower cost energy and capacity...outside the ATC footprint in 2013." Page 13, September 26, 2005.

<sup>5</sup> Joint Public Intervenor's (CUB, RENEW, and Clean Wisconsin) Comments, pp. 2, 3, 15, 21, and 28, September 27, 2005.

<sup>6</sup> ATC Reply Comments, p. 22, October 13, 2005. Also, ATC Filing, "2005 ATC Access Study Initiative Report," p. 31 of 33 where it states, "only the...Salem-North Madison project could result in the elimination or deferral of reliability projects," outlined in its Ten-Year Assessment, August 15, 2005. ATC also indicates that there would only be 6 miles of new right of way and that estimated corridor sharing would be 96 percent, *Ibid.*, p. 32 of 33.

<sup>7</sup> ATC Filing, August 15, 2005, p. 10, Decision Matrix.

<sup>8</sup> This uses the updated fixed charge rate value found in ATC's Reply Comments, p. 11, October 13, 2005.

<sup>9</sup> \$352.3 million times .0811 equals \$28.57 million.

<sup>10</sup> ATC Filing, August 15, 2005, p. 10, Decision Matrix.

<sup>11</sup> Intervening Utilities' comments, p. 10, September 27, 2005. ATC appears to adopt this sentiment in its Reply Comments at pp. 2 and 23, October 13, 2005.

planning reserve margin from 18 percent to 15 percent would be \$24.31 million.<sup>12</sup> With such a reduction, the Salem to North Madison line then passes the Cost-Benefit test. Ratepayers would receive a \$4.94 million dollar benefit. Table A-1 shows this result.

**Table A-1: Simple Cost-Benefit Analysis of Salem to North Madison Line in 2005 Dollars**

|  |                  |
|--|------------------|
| Annual Carrying Charge for Salem Line              | \$28.57 million  |
| Less ATC Estimated Production Cost Savings         | \$9.20 million   |
| Net Cost to Ratepayers                             | \$19.37 million  |
|  |                  |
| Less Savings from Reducing Planning Reserve Margin | \$24.31 million  |
| Net Cost to Ratepayers                             | (\$4.94 million) |

ATC's cost-benefit analysis ignores the dynamic nature of the revenue requirements for the period 2006 to 2053 and does not identify what year, on average, ratepayers would receive their payback. The following analysis addresses this issue.

Table SM-0 shows the annual revenue requirement for the Salem to North Madison line for its expected years of planning and construction 2006 to 2012 and for its 40 years of operation 2013 to 2053.<sup>13</sup> The table also takes ATC's estimated production cost savings measured in 2005 dollars and turns its one year estimate into a dynamic one using 3 percent inflation, the same inflation estimate ATC used.<sup>14</sup> Table SM-0 also uses ATC's estimated discount rate of 8.5 percent for present value purposes. The analysis in Table SM-0 shows two important results: (1) ratepayers see their first savings in 2043; and (2) on a cumulative net present value basis, ratepayers never come out ahead.<sup>15</sup>

Table SM-1 shows the annual revenue requirement for the Salem to North Madison line just as in Table SM-0. Table SM-1, however, uses the ATC estimate for savings from reducing the planning reserve margin to 15 percent measured in 2005 dollars and similarly escalates it through time using 3 percent inflation to arrive at appropriate year of occurrence dollars beginning in 2013.<sup>16</sup> The analysis in Table SM-1 shows two important results: (1) ratepayers see their first savings in 2022; and (2) on a cumulative net present value basis, ratepayers break ahead in 2047. This numerical perspective shows that the payoff to ratepayers is significantly put off into the future even when the planning reserve margin is reduced.

The Intervening Utilities believe ATC's production cost savings are unrealistically underestimated due to a variety of optionality factors and that minimal reliance should be placed on the PROMOD results.<sup>17</sup> PROMOD is a state-of-the-art engineering tool. MISO uses the same model in examining dispatch issues, various U.S utilities use the same model for rate and fuel cost

<sup>12</sup> ATC Filing, "2005 ATC Access Study Initiative Report," Table 11, p. 27 of 33, August 15, 2005.

<sup>13</sup> Annual revenue requirement is from ATC's Answer to Staff Data Request 1.1, September 23, 2005.

<sup>14</sup> Specifically, the calculation is \$9.2 million (2005 dollars) times  $(1 + .03)^8$  (8 years) = \$11.654 million for 2013 dollars.

<sup>15</sup> This analysis assumes Wisconsin ratepayers must pay the full cost of the line. MISO's cost sharing arrangement for new EHV lines such as those being considered in the Access docket is unknown.

<sup>16</sup> Specifically, the calculation is \$24.312 million (2005 dollars) times  $(1 + .03)^8$  (8 years) = \$30.798 million for 2013 dollars.

<sup>17</sup> Page 28, Intervening Utilities' Comments, September 27, 2005.

analysis in rate proceedings, and ATC has used it here appropriately as part of a screening analysis. ATC has more properly characterized the use of such PROMOD results. ATC states and Commission staff concur that, “PROMOD is a powerful tool for modeling generation production costs by utilizing power-flow algorithms that indicate optimal security-constrained economic dispatch. Its usefulness as a predictor of energy savings from various future expansion scenarios is much less certain.<sup>18</sup>” This means the PROMOD results should be used carefully with proper caveats and not thrown away.

Nevertheless, the Intervening Utilities believe the ATC estimated production cost savings are too conservative. They believe the addition of the Salem to North Madison line would further reduce congestion and allow increased importation of energy and capacity despite transmission additions such as the Arrowhead to Weston line, other significant transmission projects associated with ERGS and Weston 4, and 6,691 MW of new Illinois coal-fired generation that ATC included in its PROMOD modeling.<sup>19</sup> Given that modeling is an exercise that is not perfect, however, the results of ATC’s analysis can be subject to a sensitivity analysis using the Intervening Utilities’ theory.

Table SM-2 adopts the framework established from Table SM-0, but makes the assumption that ATC underestimated by a factor of four the production cost savings associated with the construction of a new major EHV.<sup>20</sup> The Table SM-2 analysis does not include the assumption the Commission adopts the lower 15 percent planning reserve requirement. The analysis in Table SM-2 shows these important results: (1) ratepayers see their first savings in 2021; and (2) on a cumulative net present value basis, ratepayers break ahead in 2038.

This brings up the last possibility in need of cost-benefit analysis. The analysis in Table SM-3 assumes that ATC’s production cost estimates were off by a factor of four and includes ATC’s estimate of savings from lowering the planning reserve margin to 15 percent. Under this scenario Table SM-3 shows: (1) ratepayers see their first savings in 2013; and (2) on a cumulative net present value basis, ratepayers break ahead in 2017. This numerical perspective shows that the payoff to ratepayers is significantly closer. However, it crucially depends on the Commission adopting a new planning reserve policy, and the Commission accepting as fact that production cost savings have been significantly, permanently underestimated in ATC’s original analysis.

### **Byron to North Madison:**

Relative to the Salem to North Madison EHV, the Byron to Madison alternative presents a slightly more favorable profile in terms of when dynamic ratepayer savings and break ahead points occur. Results using the same methodology as above are compiled in Tables BM-0 to BM-3 just as they were for the Salem to North Madison project. The main conclusions are: (1) with ATC’s estimate of production cost savings alone, ratepayers see their first savings in 2028 but never break ahead; (2) If reducing the planning reserve margin is included, ratepayers see their

<sup>18</sup> “Analysis and Comments of American Transmission Company,” pp. 6 and 7, August 15, 2005.

<sup>19</sup> ATC Reply Comments, p. 5, October 13, 2005.

<sup>20</sup> ATC’s production cost savings for Salem to North Madison are based on 648 GWH of imports. This analysis multiplies that value by four to get 2,592 GWH.

first savings in 2013, and break ahead in 2015; and (3) quadrupling ATC production cost savings means ratepayers break ahead in 2013-2014.

### **Paddock to Rockdale:**

Relative to either the Byron or the Salem to North Madison EHV's, the Paddock to Rockdale alternative presents a favorable profile in terms of when dynamic ratepayer savings and break ahead points occur. Results using the same methodology as above are compiled in Tables PR-0 to PR-3 just as they were for the Byron and Salem to North Madison projects. The main conclusions are: (1) with ATC's estimate of production cost savings alone, ratepayers see their first savings in 2016 and break ahead in 2025; (2) reducing the planning reserve margin to 15 percent or quadrupling the estimated production cost savings shows first savings in 2013.

TABLE SM-0

**Ratepayer Cost-Benefit Analysis for Salem-North Madison Line**  
**ATC's 648 GWH Imports Per ATC Report**

|    |      | Annual<br>Revenue<br>Requirement | Less<br>ATC Estimated<br>Production Savings<br>Based on 648GWH | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |               |
|----|------|----------------------------------|--|--|--------------------|-----------------------------|-----------------------------|---|---------------|
| 1  | 2006 | \$266,189                        |  | \$0  | \$0                | 0.9217                      | \$245,335                   | \$245,335                               |               |
| 2  | 2007 | \$3,178,009                      |  | \$0  | \$0                | 0.8495                      | \$2,699,577                 | \$2,944,912                             |               |
| 3  | 2008 | \$2,994,116                      |  | \$0  | \$0                | 0.7829                      | \$2,344,117                 | \$5,289,030                             |               |
| 4  | 2009 | \$2,432,274                      |  | \$0  | \$0                | 0.7216                      | \$1,755,067                 | \$7,044,096                             |               |
| 5  | 2010 | \$989,163                        |  | \$0  | \$0                | 0.6650                      | \$657,838                   | \$7,701,934                             |               |
| 6  | 2011 | \$12,146,890                     |  | \$0  | \$0                | 0.6129                      | \$7,445,377                 | \$15,147,311                            |               |
| 7  | 2012 | \$34,856,377                     |  | \$0  | \$0                | 0.5649                      | \$19,691,286                | \$34,838,597                            |               |
| 8  | 2013 | \$57,861,220                     | \$11,654,285   |  | \$0                | 0.5207                      | \$24,058,539                | \$58,897,136                            |               |
| 9  | 2014 | \$66,614,954                     | \$12,003,913   |  | \$0                | 0.4799                      | \$26,206,729                | \$85,103,865                            |               |
| 10 | 2015 | \$63,795,315                     | \$12,364,031   |  | \$0                | 0.4423                      | \$22,747,307                | \$107,851,172                           |               |
| 11 | 2016 | \$61,166,795                     | \$12,734,952   |  | \$0                | 0.4076                      | \$19,742,579                | \$127,593,751                           |               |
| 12 | 2017 | \$58,710,282                     | \$13,117,000   |  | \$0                | 0.3757                      | \$17,129,473                | \$144,723,223                           |               |
| 13 | 2018 | \$63,065,354                     | \$13,510,510   |  | \$0                | 0.3463                      | \$17,159,298                | \$161,882,521                           |               |
| 14 | 2019 | \$60,874,284                     | \$13,915,825   |  | \$0                | 0.3191                      | \$14,986,406                | \$176,868,927                           |               |
| 15 | 2020 | \$58,718,252                     | \$14,333,300   |  | \$0                | 0.2941                      | \$13,055,385                | \$189,924,312                           |               |
| 16 | 2021 | \$56,561,158                     | \$14,763,299   |  | \$0                | 0.2711                      | \$11,331,260                | \$201,255,573                           |               |
| 17 | 2022 | \$54,404,064                     | \$15,206,198   |  | \$0                | 0.2499                      | \$9,793,927                 | \$211,049,500                           |               |
| 18 | 2023 | \$52,246,970                     | \$15,662,384   |  | \$0                | 0.2303                      | \$8,424,863                 | \$219,474,363                           |               |
| 19 | 2024 | \$50,089,877                     | \$16,132,256   |  | \$0                | 0.2122                      | \$7,207,294                 | \$226,681,657                           |               |
| 20 | 2025 | \$47,932,783                     | \$16,616,223   |  | \$0                | 0.1956                      | \$6,126,032                 | \$232,807,689                           |               |
| 21 | 2026 | \$45,775,689                     | \$17,114,710   |  | \$0                | 0.1803                      | \$5,167,334                 | \$237,975,023                           |               |
| 22 | 2027 | \$43,618,596                     | \$17,628,151   |  | \$0                | 0.1662                      | \$4,318,764                 | \$242,293,787                           |               |
| 23 | 2028 | \$41,774,724                     | \$18,156,996   |  | \$0                | 0.1531                      | \$3,617,047                 | \$245,910,834                           |               |
| 24 | 2029 | \$40,558,360                     | \$18,701,706   |  | \$0                | 0.1412                      | \$3,085,105                 | \$248,995,939                           |               |
| 25 | 2030 | \$39,655,219                     | \$19,262,757   |  | \$0                | 0.1301                      | \$2,652,932                 | \$251,648,872                           |               |
| 26 | 2031 | \$38,752,077                     | \$19,840,640   |  | \$0                | 0.1199                      | \$2,267,521                 | \$253,916,393                           |               |
| 27 | 2032 | \$37,848,935                     | \$20,435,859   |  | \$0                | 0.1105                      | \$1,924,299                 | \$255,840,692                           |               |
| 28 | 2033 | \$36,945,794                     | \$21,048,935   |  | \$0                | 0.1019                      | \$1,619,119                 | \$257,459,810                           |               |
| 29 | 2034 | \$36,042,652                     | \$21,680,403   |  | \$0                | 0.0939                      | \$1,348,218                 | \$258,808,028                           |               |
| 30 | 2035 | \$35,139,511                     | \$22,330,815   |  | \$0                | 0.0865                      | \$1,108,186                 | \$259,916,215                           |               |
| 31 | 2036 | \$34,236,369                     | \$23,000,739   |  | \$0                | 0.0797                      | \$895,933                   | \$260,812,148                           |               |
| 32 | 2037 | \$33,333,227                     | \$23,690,761   |  | \$0                | 0.0735                      | \$708,658                   | \$261,520,805                           |               |
| 33 | 2038 | \$32,430,086                     | \$24,401,484   |  | \$0                | 0.0677                      | \$543,824                   | \$262,064,629                           |               |
| 34 | 2039 | \$31,526,944                     | \$25,133,529   |  | \$0                | 0.0624                      | \$399,137                   | \$262,463,766                           |               |
| 35 | 2040 | \$30,623,802                     | \$25,887,535   |  | \$0                | 0.0575                      | \$272,518                   | \$262,736,284                           |               |
| 36 | 2041 | \$29,720,661                     | \$26,664,161   |  | \$0                | 0.0530                      | \$162,089                   | \$262,898,374                           |               |
| 37 | 2042 | \$28,817,519                     | \$27,464,085   |  | \$0                | 0.0489                      | \$66,151                    | \$262,964,525                           |               |
| 38 | 2043 | \$27,914,378                     | \$28,288,008   |  | \$0                | 0.0450                      | -\$16,831                   | \$262,947,693                           | First Savings |
| 39 | 2044 | \$27,011,236                     | \$29,136,648   |  | \$0                | 0.0415                      | -\$88,244                   | \$262,859,450                           |               |
| 40 | 2045 | \$26,108,094                     | \$30,010,748   |  | \$0                | 0.0383                      | -\$149,338                  | \$262,710,112                           |               |
| 41 | 2046 | \$25,204,953                     | \$30,911,070   |  | \$0                | 0.0353                      | -\$201,243                  | \$262,508,869                           |               |
| 42 | 2047 | \$24,301,811                     | \$31,838,402   |  | \$0                | 0.0325                      | -\$244,977                  | \$262,263,891                           |               |
| 43 | 2048 | \$23,398,670                     | \$32,793,554   |  | \$0                | 0.0300                      | -\$281,457                  | \$261,982,434                           |               |
| 44 | 2049 | \$22,495,528                     | \$33,777,361   |  | \$0                | 0.0276                      | -\$311,509                  | \$261,670,924                           |               |
| 45 | 2050 | \$21,592,386                     | \$34,790,682   |  | \$0                | 0.0254                      | -\$335,877                  | \$261,335,048                           |               |
| 46 | 2051 | \$20,689,245                     | \$35,834,402   |  | \$0                | 0.0235                      | -\$355,227                  | \$260,979,821                           |               |
| 47 | 2052 | \$19,786,103                     | \$36,909,434   |  | \$0                | 0.0216                      | -\$370,161                  | \$260,609,660                           |               |
| 48 | 2053 | \$13,649,769                     | \$38,016,717   |  | \$0                | 0.0199                      | -\$485,483                  | \$260,124,177                           |               |

TABLE SM-1

**Ratepayer Cost-Benefit Analysis for Salem-North Madison Line**  
**ATC's 648 GWH Imports and Reducing Planning Reserve Margin to 15% from 18%**

|    |      | Less<br>ATC Estimated<br>Production Savings<br>Based on 648GWH | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                         |
|----|------|--|--|--------------------|-----------------------------|-----------------------------|---|-------------------------|
| 1  | 2006 | \$266,189  | \$0  | \$0                | 0.9217                      | \$245,335                   | \$245,335                               |                         |
| 2  | 2007 | \$3,178,009  | \$0  | \$0                | 0.8495                      | \$2,699,577                 | \$2,944,912                             |                         |
| 3  | 2008 | \$2,994,116  | \$0  | \$0                | 0.7829                      | \$2,344,117                 | \$5,289,030                             |                         |
| 4  | 2009 | \$2,432,274  | \$0  | \$0                | 0.7216                      | \$1,755,067                 | \$7,044,096                             |                         |
| 5  | 2010 | \$989,163  | \$0  | \$0                | 0.6650                      | \$657,838                   | \$7,701,934                             |                         |
| 6  | 2011 | \$12,146,890   | \$0  | \$0                | 0.6129                      | \$7,445,377                 | \$15,147,311                            |                         |
| 7  | 2012 | \$34,856,377   | \$0  | \$0                | 0.5649                      | \$19,691,286                | \$34,838,597                            |                         |
| 8  | 2013 | \$57,861,220   | \$11,654,285   | \$30,798,698       | 0.5207                      | \$8,022,598                 | \$42,861,195                            |                         |
| 9  | 2014 | \$66,614,954   | \$12,003,913   | \$31,722,659       | 0.4799                      | \$10,983,669                | \$53,844,864                            |                         |
| 10 | 2015 | \$63,795,315   | \$12,364,031   | \$32,674,339       | 0.4423                      | \$8,295,923                 | \$62,140,787                            |                         |
| 11 | 2016 | \$61,166,795   | \$12,734,952   | \$33,654,569       | 0.4076                      | \$6,023,754                 | \$68,164,541                            |                         |
| 12 | 2017 | \$58,710,282   | \$13,117,000   | \$34,664,206       | 0.3757                      | \$4,106,072                 | \$72,270,613                            |                         |
| 13 | 2018 | \$63,065,354   | \$13,510,510   | \$35,704,133       | 0.3463                      | \$4,796,070                 | \$77,066,682                            |                         |
| 14 | 2019 | \$60,874,284   | \$13,915,825   | \$36,775,257       | 0.3191                      | \$3,249,885                 | \$80,316,568                            |                         |
| 15 | 2020 | \$58,718,252   | \$14,333,300   | \$37,878,514       | 0.2941                      | \$1,913,803                 | \$82,230,370                            |                         |
| 16 | 2021 | \$56,561,158   | \$14,763,299   | \$39,014,870       | 0.2711                      | \$754,459                   | \$82,984,829                            |                         |
| 17 | 2022 | \$54,404,064   | \$15,206,198   | \$40,185,316       | 0.2499                      | -\$246,723                  | \$82,738,106                            | <i>First Savings</i>    |
| 18 | 2023 | \$52,246,970   | \$15,662,384   | \$41,390,875       | 0.2303                      | -\$1,106,814                | \$81,631,292                            |                         |
| 19 | 2024 | \$50,089,877   | \$16,132,256   | \$42,632,602       | 0.2122                      | -\$1,841,211                | \$79,790,082                            |                         |
| 20 | 2025 | \$47,932,783   | \$16,616,223   | \$43,911,580       | 0.1956                      | -\$2,463,792                | \$77,326,289                            |                         |
| 21 | 2026 | \$45,775,689   | \$17,114,710   | \$45,228,927       | 0.1803                      | -\$2,987,062                | \$74,339,228                            |                         |
| 22 | 2027 | \$43,618,596   | \$17,628,151   | \$46,585,795       | 0.1662                      | -\$3,422,275                | \$70,916,952                            |                         |
| 23 | 2028 | \$41,774,724   | \$18,156,996   | \$47,983,369       | 0.1531                      | -\$3,731,589                | \$67,185,363                            |                         |
| 24 | 2029 | \$40,558,360   | \$18,701,706   | \$49,422,870       | 0.1412                      | -\$3,891,020                | \$63,294,343                            |                         |
| 25 | 2030 | \$39,655,219   | \$19,262,757   | \$50,905,556       | 0.1301                      | -\$3,969,564                | \$59,324,779                            |                         |
| 26 | 2031 | \$38,752,077   | \$19,840,640   | \$52,432,723       | 0.1199                      | -\$4,019,273                | \$55,305,507                            |                         |
| 27 | 2032 | \$37,848,935   | \$20,435,859   | \$54,005,704       | 0.1105                      | -\$4,043,809                | \$51,261,697                            |                         |
| 28 | 2033 | \$36,945,794   | \$21,048,935   | \$55,625,875       | 0.1019                      | -\$4,046,459                | \$47,215,238                            |                         |
| 29 | 2034 | \$36,042,652   | \$21,680,403   | \$57,294,652       | 0.0939                      | -\$4,030,165                | \$43,185,074                            |                         |
| 30 | 2035 | \$35,139,511   | \$22,330,815   | \$59,013,491       | 0.0865                      | -\$3,997,559                | \$39,187,515                            |                         |
| 31 | 2036 | \$34,236,369   | \$23,000,739   | \$60,783,896       | 0.0797                      | -\$3,950,996                | \$35,236,519                            |                         |
| 32 | 2037 | \$33,333,227   | \$23,690,761   | \$62,607,413       | 0.0735                      | -\$3,892,574                | \$31,343,944                            |                         |
| 33 | 2038 | \$32,430,086   | \$24,401,484   | \$64,485,635       | 0.0677                      | -\$3,824,166                | \$27,519,779                            |                         |
| 34 | 2039 | \$31,526,944   | \$25,133,529   | \$66,420,204       | 0.0624                      | -\$3,747,434                | \$23,772,344                            |                         |
| 35 | 2040 | \$30,623,802   | \$25,887,535   | \$68,412,810       | 0.0575                      | -\$3,663,858                | \$20,108,486                            |                         |
| 36 | 2041 | \$29,720,661   | \$26,664,161   | \$70,465,195       | 0.0530                      | -\$3,574,747                | \$16,533,739                            |                         |
| 37 | 2042 | \$28,817,519   | \$27,464,085   | \$72,579,151       | 0.0489                      | -\$3,481,260                | \$13,052,479                            |                         |
| 38 | 2043 | \$27,914,378   | \$28,288,008   | \$74,756,525       | 0.0450                      | -\$3,384,420                | \$9,668,059                             |                         |
| 39 | 2044 | \$27,011,236   | \$29,136,648   | \$76,999,221       | 0.0415                      | -\$3,285,125                | \$6,382,934                             |                         |
| 40 | 2045 | \$26,108,094   | \$30,010,748   | \$79,309,197       | 0.0383                      | -\$3,184,166                | \$3,198,768                             |                         |
| 41 | 2046 | \$25,204,953   | \$30,911,070   | \$81,688,473       | 0.0353                      | -\$3,082,232                | \$116,536                               |                         |
| 42 | 2047 | \$24,301,811   | \$31,838,402   | \$84,139,128       | 0.0325                      | -\$2,979,925                | -\$2,863,389                            | <i>Break Ahead Year</i> |
| 43 | 2048 | \$23,398,670   | \$32,793,554   | \$86,663,301       | 0.0300                      | -\$2,877,767                | -\$5,741,156                            |                         |
| 44 | 2049 | \$22,495,528   | \$33,777,361   | \$89,263,200       | 0.0276                      | -\$2,776,209                | -\$8,517,365                            |                         |
| 45 | 2050 | \$21,592,386   | \$34,790,682   | \$91,941,096       | 0.0254                      | -\$2,675,637                | -\$11,193,002                           |                         |
| 46 | 2051 | \$20,689,245   | \$35,834,402   | \$94,699,329       | 0.0235                      | -\$2,576,382                | -\$13,769,384                           |                         |
| 47 | 2052 | \$19,786,103   | \$36,909,434   | \$97,540,309       | 0.0216                      | -\$2,478,723                | -\$16,248,107                           |                         |
| 48 | 2053 | \$13,649,769   | \$38,016,717   | \$100,466,518      | 0.0199                      | -\$2,487,159                | -\$18,735,267                           |                         |

TABLE SM-2

**Ratepayer Cost-Benefit Analysis for Salem-North Madison Line**  
**Quadrupling ATC's Estimated GWH Imports and Keeping Planning Reserve Margin at 18%**

|    |      | Annual<br>Revenue<br><u>Requirement</u> | Less<br>ATC Estimated<br>Production Savings<br><u>Quadrupled</u> | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15%<br><u>Reserve Margin to 15%</u> | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                         |
|----|------|---|--|--|--------------------|-----------------------------|-----------------------------|---|-------------------------|
| 1  | 2006 | \$266,189                               |  | \$0  | \$0                | 0.9217                      | \$245,335                   | \$245,335                               |                         |
| 2  | 2007 | \$3,178,009                             |  | \$0  | \$0                | 0.8495                      | \$2,699,577                 | \$2,944,912                             |                         |
| 3  | 2008 | \$2,994,116                             |  | \$0  | \$0                | 0.7829                      | \$2,344,117                 | \$5,289,030                             |                         |
| 4  | 2009 | \$2,432,274                             |  | \$0  | \$0                | 0.7216                      | \$1,755,067                 | \$7,044,096                             |                         |
| 5  | 2010 | \$989,163                               |  | \$0  | \$0                | 0.6650                      | \$657,838                   | \$7,701,934                             |                         |
| 6  | 2011 | \$12,146,890                            |  | \$0  | \$0                | 0.6129                      | \$7,445,377                 | \$15,147,311                            |                         |
| 7  | 2012 | \$34,856,377                            |  | \$0  | \$0                | 0.5649                      | \$19,691,286                | \$34,838,597                            |                         |
| 8  | 2013 | \$57,861,220                            | \$46,617,139   |  | \$0                | 0.5207                      | \$5,854,449                 | \$40,693,046                            |                         |
| 9  | 2014 | \$66,614,954                            | \$48,015,653   |  | \$0                | 0.4799                      | \$8,925,427                 | \$49,618,473                            |                         |
| 10 | 2015 | \$63,795,315                            | \$49,456,123   |  | \$0                | 0.4423                      | \$6,342,016                 | \$55,960,488                            |                         |
| 11 | 2016 | \$61,166,795                            | \$50,939,806   |  | \$0                | 0.4076                      | \$4,168,892                 | \$60,129,381                            |                         |
| 12 | 2017 | \$58,710,282                            | \$52,468,001   |  | \$0                | 0.3757                      | \$2,345,235                 | \$62,474,616                            |                         |
| 13 | 2018 | \$63,065,354                            | \$54,042,041   |  | \$0                | 0.3463                      | \$3,124,492                 | \$65,599,108                            |                         |
| 14 | 2019 | \$60,874,284                            | \$55,663,302   |  | \$0                | 0.3191                      | \$1,663,042                 | \$67,262,150                            |                         |
| 15 | 2020 | \$58,718,252                            | \$57,333,201   |  | \$0                | 0.2941                      | \$407,399                   | \$67,669,549                            |                         |
| 16 | 2021 | \$56,561,158                            | \$59,053,197   |  | \$0                | 0.2711                      | -\$675,583                  | \$66,993,965                            | <b>First Savings</b>    |
| 17 | 2022 | \$54,404,064                            | \$60,824,793   |  | \$0                | 0.2499                      | -\$1,604,275                | \$65,389,691                            |                         |
| 18 | 2023 | \$52,246,970                            | \$62,649,537   |  | \$0                | 0.2303                      | -\$2,395,550                | \$62,994,141                            |                         |
| 19 | 2024 | \$50,089,877                            | \$64,529,023   |  | \$0                | 0.2122                      | -\$3,064,619                | \$59,929,522                            |                         |
| 20 | 2025 | \$47,932,783                            | \$66,464,893   |  | \$0                | 0.1956                      | -\$3,625,185                | \$56,304,337                            |                         |
| 21 | 2026 | \$45,775,689                            | \$68,458,840   |  | \$0                | 0.1803                      | -\$4,089,582                | \$52,214,756                            |                         |
| 22 | 2027 | \$43,618,596                            | \$70,512,605   |  | \$0                | 0.1662                      | -\$4,468,907                | \$47,745,849                            |                         |
| 23 | 2028 | \$41,774,724                            | \$72,627,984   |  | \$0                | 0.1531                      | -\$4,725,166                | \$43,020,683                            |                         |
| 24 | 2029 | \$40,558,360                            | \$74,806,823   |  | \$0                | 0.1412                      | -\$4,834,231                | \$38,186,452                            |                         |
| 25 | 2030 | \$39,655,219                            | \$77,051,028   |  | \$0                | 0.1301                      | -\$4,864,962                | \$33,321,490                            |                         |
| 26 | 2031 | \$38,752,077                            | \$79,362,559   |  | \$0                | 0.1199                      | -\$4,869,282                | \$28,452,208                            |                         |
| 27 | 2032 | \$37,848,935                            | \$81,743,435   |  | \$0                | 0.1105                      | -\$4,850,731                | \$23,601,477                            |                         |
| 28 | 2033 | \$36,945,794                            | \$84,195,738   |  | \$0                | 0.1019                      | -\$4,812,477                | \$18,789,000                            |                         |
| 29 | 2034 | \$36,042,652                            | \$86,721,611   |  | \$0                | 0.0939                      | -\$4,757,352                | \$14,031,648                            |                         |
| 30 | 2035 | \$35,139,511                            | \$89,323,259   |  | \$0                | 0.0865                      | -\$4,687,884                | \$9,343,764                             |                         |
| 31 | 2036 | \$34,236,369                            | \$92,002,957   |  | \$0                | 0.0797                      | -\$4,606,328                | \$4,737,436                             |                         |
| 32 | 2037 | \$33,333,227                            | \$94,763,045   |  | \$0                | 0.0735                      | -\$4,514,687                | \$222,749                               |                         |
| 33 | 2038 | \$32,430,086                            | \$97,605,937   |  | \$0                | 0.0677                      | -\$4,414,742                | -\$4,191,993                            | <b>Break Ahead Year</b> |
| 34 | 2039 | \$31,526,944                            | \$100,534,115  |  | \$0                | 0.0624                      | -\$4,308,074                | -\$8,500,067                            |                         |
| 35 | 2040 | \$30,623,802                            | \$103,550,138  |  | \$0                | 0.0575                      | -\$4,196,078                | -\$12,696,145                           |                         |
| 36 | 2041 | \$29,720,661                            | \$106,656,642  |  | \$0                | 0.0530                      | -\$4,079,988                | -\$16,776,133                           |                         |
| 37 | 2042 | \$28,817,519                            | \$109,856,342  |  | \$0                | 0.0489                      | -\$3,960,890                | -\$20,737,023                           |                         |
| 38 | 2043 | \$27,914,378                            | \$113,152,032  |  | \$0                | 0.0450                      | -\$3,839,737                | -\$24,576,760                           |                         |
| 39 | 2044 | \$27,011,236                            | \$116,546,593  |  | \$0                | 0.0415                      | -\$3,717,361                | -\$28,294,121                           |                         |
| 40 | 2045 | \$26,108,094                            | \$120,042,991  |  | \$0                | 0.0383                      | -\$3,594,491                | -\$31,888,612                           |                         |
| 41 | 2046 | \$25,204,953                            | \$123,644,280  |  | \$0                | 0.0353                      | -\$3,471,757                | -\$35,360,370                           |                         |
| 42 | 2047 | \$24,301,811                            | \$127,353,609  |  | \$0                | 0.0325                      | -\$3,349,705                | -\$38,710,075                           |                         |
| 43 | 2048 | \$23,398,670                            | \$131,174,217  |  | \$0                | 0.0300                      | -\$3,228,803                | -\$41,938,878                           |                         |
| 44 | 2049 | \$22,495,528                            | \$135,109,444  |  | \$0                | 0.0276                      | -\$3,109,450                | -\$45,048,328                           |                         |
| 45 | 2050 | \$21,592,386                            | \$139,162,727  |  | \$0                | 0.0254                      | -\$2,991,986                | -\$48,040,314                           |                         |
| 46 | 2051 | \$20,689,245                            | \$143,337,609  |  | \$0                | 0.0235                      | -\$2,876,695                | -\$50,917,008                           |                         |
| 47 | 2052 | \$19,786,103                            | \$147,637,737  |  | \$0                | 0.0216                      | -\$2,763,813                | -\$53,680,821                           |                         |
| 48 | 2053 | \$13,649,769                            | \$152,066,869  |  | \$0                | 0.0199                      | -\$2,757,797                | -\$56,438,618                           |                         |



TABLE SM-3

**Ratepayer Cost-Benefit Analysis for Salem-North Madison Line****Quadrupling ATC's Estimated Production Cost Savings and Reducing Planning Reserve Margin to 15% from 18%**

|    |      | Annual<br>Revenue<br>Requirement | Less<br>ATC Estimated<br>Production Savings<br>Quadrupled | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                         |
|----|------|----------------------------------|---|--|--------------------|-----------------------------|-----------------------------|---|-------------------------|
| 1  | 2006 | \$266,189                        |   | \$0  | \$0                | 0.9217                      | \$245,335                   | \$245,335                               |                         |
| 2  | 2007 | \$3,178,009                      |   | \$0  | \$3,178,009        | 0.8495                      | \$2,699,577                 | \$2,944,912                             |                         |
| 3  | 2008 | \$2,994,116                      |   | \$0  | \$2,994,116        | 0.7829                      | \$2,344,117                 | \$5,289,030                             |                         |
| 4  | 2009 | \$2,432,274                      |   | \$0  | \$2,432,274        | 0.7216                      | \$1,755,067                 | \$7,044,096                             |                         |
| 5  | 2010 | \$989,163                        |   | \$0  | \$0                | 0.6650                      | \$657,838                   | \$7,701,934                             |                         |
| 6  | 2011 | \$12,146,890                     |   | \$0  | \$0                | 0.6129                      | \$7,445,377                 | \$15,147,311                            |                         |
| 7  | 2012 | \$34,856,377                     |   | \$0  | \$0                | 0.5649                      | \$19,691,286                | \$34,838,597                            |                         |
| 8  | 2013 | \$57,861,220                     | \$46,617,139  | \$30,798,698   | -\$19,554,618      | 0.5207                      | -\$10,181,492               | \$24,657,105                            | <i>First Savings</i>    |
| 9  | 2014 | \$66,614,954                     | \$48,015,653  | \$31,722,659   | -\$13,123,358      | 0.4799                      | -\$6,297,633                | \$18,359,472                            |                         |
| 10 | 2015 | \$63,795,315                     | \$49,456,123  | \$32,674,339   | -\$18,335,147      | 0.4423                      | -\$8,109,368                | \$10,250,104                            |                         |
| 11 | 2016 | \$61,166,795                     | \$50,939,806  | \$33,654,569   | -\$23,427,581      | 0.4076                      | -\$9,549,933                | \$700,171                               |                         |
| 12 | 2017 | \$58,710,282                     | \$52,468,001  | \$34,664,206   | -\$28,421,925      | 0.3757                      | -\$10,678,165               | -\$9,977,994                            | <i>Break Ahead Year</i> |
| 13 | 2018 | \$63,065,354                     | \$54,042,041  | \$35,704,133   | -\$26,680,819      | 0.3463                      | -\$9,238,736                | -\$19,216,731                           |                         |
| 14 | 2019 | \$60,874,284                     | \$55,663,302  | \$36,775,257   | -\$31,564,275      | 0.3191                      | -\$10,073,479               | -\$29,290,209                           |                         |
| 15 | 2020 | \$58,718,252                     | \$57,333,201  | \$37,878,514   | -\$36,493,464      | 0.2941                      | -\$10,734,183               | -\$40,024,393                           |                         |
| 16 | 2021 | \$56,561,158                     | \$59,053,197  | \$39,014,870   | -\$41,506,909      | 0.2711                      | -\$11,252,385               | -\$51,276,778                           |                         |
| 17 | 2022 | \$54,404,064                     | \$60,824,793  | \$40,185,316   | -\$46,606,045      | 0.2499                      | -\$11,644,925               | -\$62,921,703                           |                         |
| 18 | 2023 | \$52,246,970                     | \$62,649,537  | \$41,390,875   | -\$51,793,442      | 0.2303                      | -\$11,927,227               | -\$74,848,930                           |                         |
| 19 | 2024 | \$50,089,877                     | \$64,529,023  | \$42,632,602   | -\$57,071,748      | 0.2122                      | -\$12,113,124               | -\$86,962,053                           |                         |
| 20 | 2025 | \$47,932,783                     | \$66,464,893  | \$43,911,580   | -\$62,443,690      | 0.1956                      | -\$12,215,009               | -\$99,177,062                           |                         |
| 21 | 2026 | \$45,775,689                     | \$68,458,840  | \$45,228,927   | -\$67,912,078      | 0.1803                      | -\$12,243,977               | -\$111,421,040                          |                         |
| 22 | 2027 | \$43,618,596                     | \$70,512,605  | \$46,585,795   | -\$73,479,805      | 0.1662                      | -\$12,209,946               | -\$123,630,986                          |                         |
| 23 | 2028 | \$41,774,724                     | \$72,627,984  | \$47,983,369   | -\$78,836,628      | 0.1531                      | -\$12,073,802               | -\$135,704,788                          |                         |
| 24 | 2029 | \$40,558,360                     | \$74,806,823  | \$49,422,870   | -\$83,671,333      | 0.1412                      | -\$11,810,355               | -\$147,515,144                          |                         |
| 25 | 2030 | \$39,655,219                     | \$77,051,028  | \$50,905,556   | -\$88,301,365      | 0.1301                      | -\$11,487,459               | -\$159,002,603                          |                         |
| 26 | 2031 | \$38,752,077                     | \$79,362,559  | \$52,432,723   | -\$93,043,204      | 0.1199                      | -\$11,156,076               | -\$170,158,679                          |                         |
| 27 | 2032 | \$37,848,935                     | \$81,743,435  | \$54,005,704   | -\$97,900,204      | 0.1105                      | -\$10,818,839               | -\$180,977,518                          |                         |
| 28 | 2033 | \$36,945,794                     | \$84,195,738  | \$55,625,875   | -\$102,875,820     | 0.1019                      | -\$10,478,054               | -\$191,455,572                          |                         |
| 29 | 2034 | \$36,042,652                     | \$86,721,611  | \$57,294,652   | -\$107,973,610     | 0.0939                      | -\$10,135,734               | -\$201,591,306                          |                         |
| 30 | 2035 | \$35,139,511                     | \$89,323,259  | \$59,013,491   | -\$113,197,240     | 0.0865                      | -\$9,793,630                | -\$211,384,936                          |                         |
| 31 | 2036 | \$34,236,369                     | \$92,002,957  | \$60,783,896   | -\$118,550,484     | 0.0797                      | -\$9,453,257                | -\$220,838,193                          |                         |
| 32 | 2037 | \$33,333,227                     | \$94,763,045  | \$62,607,413   | -\$124,037,231     | 0.0735                      | -\$9,115,919                | -\$229,954,111                          |                         |
| 33 | 2038 | \$32,430,086                     | \$97,605,937  | \$64,485,635   | -\$129,661,486     | 0.0677                      | -\$8,782,732                | -\$238,736,844                          |                         |
| 34 | 2039 | \$31,526,944                     | \$100,534,115   | \$66,420,204   | -\$135,427,375     | 0.0624                      | -\$8,454,645                | -\$247,191,488                          |                         |
| 35 | 2040 | \$30,623,802                     | \$103,550,138   | \$68,412,810   | -\$141,339,146     | 0.0575                      | -\$8,132,454                | -\$255,323,943                          |                         |
| 36 | 2041 | \$29,720,661                     | \$106,656,642   | \$70,465,195   | -\$147,401,176     | 0.0530                      | -\$7,816,825                | -\$263,140,767                          |                         |
| 37 | 2042 | \$28,817,519                     | \$109,856,342   | \$72,579,151   | -\$153,617,973     | 0.0489                      | -\$7,508,302                | -\$270,649,069                          |                         |
| 38 | 2043 | \$27,914,378                     | \$113,152,032   | \$74,756,525   | -\$159,994,179     | 0.0450                      | -\$7,207,325                | -\$277,856,394                          |                         |
| 39 | 2044 | \$27,011,236                     | \$116,546,593   | \$76,999,221   | -\$166,534,578     | 0.0415                      | -\$6,914,243                | -\$284,770,637                          |                         |
| 40 | 2045 | \$26,108,094                     | \$120,042,991   | \$79,309,197   | -\$173,244,094     | 0.0383                      | -\$6,629,319                | -\$291,399,956                          |                         |
| 41 | 2046 | \$25,204,953                     | \$123,644,280   | \$81,688,473   | -\$180,127,801     | 0.0353                      | -\$6,352,746                | -\$297,752,702                          |                         |
| 42 | 2047 | \$24,301,811                     | \$127,353,609   | \$84,139,128   | -\$187,190,925     | 0.0325                      | -\$6,084,653                | -\$303,837,355                          |                         |
| 43 | 2048 | \$23,398,670                     | \$131,174,217   | \$86,663,301   | -\$194,438,849     | 0.0300                      | -\$5,825,112                | -\$309,662,467                          |                         |
| 44 | 2049 | \$22,495,528                     | \$135,109,444   | \$89,263,200   | -\$201,877,116     | 0.0276                      | -\$5,574,149                | -\$315,236,616                          |                         |
| 45 | 2050 | \$21,592,386                     | \$139,162,727   | \$91,941,096   | -\$209,511,437     | 0.0254                      | -\$5,331,747                | -\$320,568,363                          |                         |
| 46 | 2051 | \$20,689,245                     | \$143,337,609   | \$94,699,329   | -\$217,347,693     | 0.0235                      | -\$5,097,850                | -\$325,666,213                          |                         |
| 47 | 2052 | \$19,786,103                     | \$147,637,737   | \$97,540,309   | -\$225,391,943     | 0.0216                      | -\$4,872,375                | -\$330,538,588                          |                         |
| 48 | 2053 | \$13,649,769                     | \$152,066,869   | \$100,466,518  | -\$238,883,619     | 0.0199                      | -\$4,759,474                | -\$335,298,062                          |                         |

TABLE BM-0

**Ratepayer Cost-Benefit Analysis for Byron-North Madison Line**  
**ATC's 802 GWH Imports Per ATC Report**

|    |             | Less               | Less                  |          | 8.50%         | 2005       | Present Value |
|----|-------------|--------------------|-----------------------|----------|---------------|------------|---------------|
|    | Annual      | ATC Estimated      | Savings From          | Annual   | Discount      | Discounted | Cumulative    |
|    | Revenue     | Production Savings | Reducing Planning     | Net Cost | Factor        | Value      | Net Cost      |
|    | Requirement | Based on 802GWH    | Reserve Margin to 15% |          |               |            |               |
| 1  | 2006        | \$0                | \$0                   | \$0      | \$0           | 0.9217     | \$0           |
| 2  | 2007        | \$3,178,009        | \$0                   | \$0      | \$3,178,009   | 0.8495     | \$2,699,577   |
| 3  | 2008        | \$2,994,116        | \$0                   | \$0      | \$2,994,116   | 0.7829     | \$2,344,117   |
| 4  | 2009        | \$2,432,274        | \$0                   | \$0      | \$2,432,274   | 0.7216     | \$1,755,067   |
| 5  | 2010        | \$534,947          | \$0                   | \$0      | \$534,947     | 0.6650     | \$355,764     |
| 6  | 2011        | \$5,981,188        | \$0                   | \$0      | \$5,981,188   | 0.6129     | \$3,666,140   |
| 7  | 2012        | \$16,713,730       | \$0                   | \$0      | \$16,713,730  | 0.5649     | \$9,442,027   |
| 8  | 2013        | \$27,316,688       | \$13,427,763          | \$0      | \$13,888,925  | 0.5207     | \$7,231,539   |
| 9  | 2014        | \$31,304,879       | \$13,830,596          | \$0      | \$17,474,283  | 0.4799     | \$8,385,553   |
| 10 | 2015        | \$29,978,981       | \$14,245,514          | \$0      | \$15,733,467  | 0.4423     | \$6,958,683   |
| 11 | 2016        | \$28,743,001       | \$14,672,879          | \$0      | \$14,070,122  | 0.4076     | \$5,735,493   |
| 12 | 2017        | \$27,587,947       | \$15,113,065          | \$0      | \$12,474,881  | 0.3757     | \$4,686,834   |
| 13 | 2018        | \$29,632,537       | \$15,566,457          | \$0      | \$14,066,080  | 0.3463     | \$4,870,645   |
| 14 | 2019        | \$28,602,369       | \$16,033,451          | \$0      | \$12,568,918  | 0.3191     | \$4,011,267   |
| 15 | 2020        | \$27,588,686       | \$16,514,455          | \$0      | \$11,074,231  | 0.2941     | \$3,257,373   |
| 16 | 2021        | \$26,574,503       | \$17,009,888          | \$0      | \$9,564,615   | 0.2711     | \$2,592,935   |
| 17 | 2022        | \$25,560,320       | \$17,520,185          | \$0      | \$8,040,135   | 0.2499     | \$2,008,898   |
| 18 | 2023        | \$24,546,137       | \$18,045,790          | \$0      | \$6,500,347   | 0.2303     | \$1,496,929   |
| 19 | 2024        | \$23,531,954       | \$18,587,164          | \$0      | \$4,944,790   | 0.2122     | \$1,049,501   |
| 20 | 2025        | \$22,517,771       | \$19,144,779          | \$0      | \$3,372,992   | 0.1956     | \$659,813     |
| 21 | 2026        | \$21,503,588       | \$19,719,122          | \$0      | \$1,784,466   | 0.1803     | \$321,724     |
| 22 | 2027        | \$20,489,405       | \$20,310,696          | \$0      | \$178,709     | 0.1662     | \$29,696      |
| 23 | 2028        | \$19,622,588       | \$20,920,017          | \$0      | -\$1,297,429  | 0.1531     | -\$198,701    |
| 24 | 2029        | \$19,051,000       | \$21,547,618          | \$0      | -\$2,496,617  | 0.1412     | -\$352,402    |
| 25 | 2030        | \$18,626,778       | \$22,194,046          | \$0      | -\$3,567,268  | 0.1301     | -\$464,079    |
| 26 | 2031        | \$18,202,556       | \$22,859,867          | \$0      | -\$4,657,311  | 0.1199     | -\$558,421    |
| 27 | 2032        | \$17,778,334       | \$23,545,663          | \$0      | -\$5,767,329  | 0.1105     | -\$637,341    |
| 28 | 2033        | \$17,354,112       | \$24,252,033          | \$0      | -\$6,897,921  | 0.1019     | -\$702,563    |
| 29 | 2034        | \$16,929,890       | \$24,979,594          | \$0      | -\$8,049,704  | 0.0939     | -\$755,644    |
| 30 | 2035        | \$16,505,668       | \$25,728,982          | \$0      | -\$9,223,314  | 0.0865     | -\$797,985    |
| 31 | 2036        | \$16,081,446       | \$26,500,852          | \$0      | -\$10,419,406 | 0.0797     | -\$830,847    |
| 32 | 2037        | \$15,657,224       | \$27,295,877          | \$0      | -\$11,638,653 | 0.0735     | -\$855,364    |
| 33 | 2038        | \$15,233,002       | \$28,114,754          | \$0      | -\$12,881,752 | 0.0677     | -\$872,557    |
| 34 | 2039        | \$14,808,780       | \$28,958,196          | \$0      | -\$14,149,416 | 0.0624     | -\$883,339    |
| 35 | 2040        | \$14,384,558       | \$29,826,942          | \$0      | -\$15,442,384 | 0.0575     | -\$888,533    |
| 36 | 2041        | \$13,960,336       | \$30,721,750          | \$0      | -\$16,761,415 | 0.0530     | -\$888,874    |
| 37 | 2042        | \$13,536,114       | \$31,643,403          | \$0      | -\$18,107,289 | 0.0489     | -\$885,020    |
| 38 | 2043        | \$13,111,892       | \$32,592,705          | \$0      | -\$19,480,813 | 0.0450     | -\$877,560    |
| 39 | 2044        | \$12,687,670       | \$33,570,486          | \$0      | -\$20,882,816 | 0.0415     | -\$867,020    |
| 40 | 2045        | \$12,263,447       | \$34,577,601          | \$0      | -\$22,314,153 | 0.0383     | -\$853,868    |
| 41 | 2046        | \$11,839,225       | \$35,614,929          | \$0      | -\$23,775,703 | 0.0353     | -\$838,521    |
| 42 | 2047        | \$11,415,003       | \$36,683,376          | \$0      | -\$25,268,373 | 0.0325     | -\$821,350    |
| 43 | 2048        | \$10,990,781       | \$37,783,878          | \$0      | -\$26,793,096 | 0.0300     | -\$802,683    |
| 44 | 2049        | \$10,566,559       | \$38,917,394          | \$0      | -\$28,350,835 | 0.0276     | -\$782,812    |
| 45 | 2050        | \$10,142,337       | \$40,084,916          | \$0      | -\$29,942,579 | 0.0254     | -\$761,993    |
| 46 | 2051        | \$9,718,115        | \$41,287,463          | \$0      | -\$31,569,348 | 0.0235     | -\$740,453    |
| 47 | 2052        | \$9,293,893        | \$42,526,087          | \$0      | -\$33,232,194 | 0.0216     | -\$718,392    |
| 48 | 2053        | \$6,411,545        | \$43,801,870          | \$0      | -\$37,390,325 | 0.0199     | -\$744,958    |

*First Savings*

TABLE BM-1

**Ratepayer Cost-Benefit Analysis for Byron-North Madison Line**  
**ATC's 802 GWH Imports and Reducing Planning Reserve Margin to 15% from 18%**

|    | Annual<br>Revenue<br>Requirement | Less<br>ATC Estimated<br>Production Savings<br>Based on 802GWH | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                         |
|----|----------------------------------|--|--|--------------------|-----------------------------|-----------------------------|---|-------------------------|
| 1  | 2006                             | \$0  | \$0  | \$0                | 0.9217                      | \$0                         | \$0                                     |                         |
| 2  | 2007                             | \$3,178,009  | \$0  | \$0                | 0.8495                      | \$2,699,577                 | \$2,699,577                             |                         |
| 3  | 2008                             | \$2,994,116  | \$0  | \$0                | 0.7829                      | \$2,344,117                 | \$5,043,694                             |                         |
| 4  | 2009                             | \$2,432,274  | \$0  | \$0                | 0.7216                      | \$1,755,067                 | \$6,798,761                             |                         |
| 5  | 2010                             | \$534,947  | \$0  | \$0                | 0.6650                      | \$355,764                   | \$7,154,525                             |                         |
| 6  | 2011                             | \$5,981,188  | \$0  | \$0                | 0.6129                      | \$3,666,140                 | \$10,820,664                            |                         |
| 7  | 2012                             | \$16,713,730   | \$0  | \$0                | 0.5649                      | \$9,442,027                 | \$20,262,691                            |                         |
| 8  | 2013                             | \$27,316,688   | \$13,427,763   | \$30,798,698       | 0.5207                      | -\$8,804,402                | \$11,458,289                            | <b>First Savings</b>    |
| 9  | 2014                             | \$31,304,879   | \$13,830,596   | \$31,722,659       | 0.4799                      | -\$6,837,506                | \$4,620,783                             |                         |
| 10 | 2015                             | \$29,978,981   | \$14,245,514   | \$32,674,339       | 0.4423                      | -\$7,492,701                | -\$2,871,918                            | <b>Break Ahead Year</b> |
| 11 | 2016                             | \$28,743,001   | \$14,672,879   | \$33,654,569       | 0.4076                      | -\$7,983,332                | -\$10,855,250                           |                         |
| 12 | 2017                             | \$27,587,947   | \$15,113,065   | \$34,664,206       | 0.3757                      | -\$8,336,567                | -\$19,191,817                           |                         |
| 13 | 2018                             | \$29,632,537   | \$15,566,457   | \$35,704,133       | 0.3463                      | -\$7,492,583                | -\$26,684,400                           |                         |
| 14 | 2019                             | \$28,602,369   | \$16,033,451   | \$36,775,257       | 0.3191                      | -\$7,725,254                | -\$34,409,654                           |                         |
| 15 | 2020                             | \$27,588,686   | \$16,514,455   | \$37,878,514       | 0.2941                      | -\$7,884,209                | -\$42,293,863                           |                         |
| 16 | 2021                             | \$26,574,503   | \$17,009,888   | \$39,014,870       | 0.2711                      | -\$7,983,866                | -\$50,277,730                           |                         |
| 17 | 2022                             | \$25,560,320   | \$17,520,185   | \$40,185,316       | 0.2499                      | -\$8,031,753                | -\$58,309,482                           |                         |
| 18 | 2023                             | \$24,546,137   | \$18,045,790   | \$41,390,875       | 0.2303                      | -\$8,034,748                | -\$66,344,230                           |                         |
| 19 | 2024                             | \$23,531,954   | \$18,587,164   | \$42,632,602       | 0.2122                      | -\$7,999,004                | -\$74,343,234                           |                         |
| 20 | 2025                             | \$22,517,771   | \$19,144,779   | \$43,911,580       | 0.1956                      | -\$7,930,012                | -\$82,273,246                           |                         |
| 21 | 2026                             | \$21,503,588   | \$19,719,122   | \$45,228,927       | 0.1803                      | -\$7,832,672                | -\$90,105,918                           |                         |
| 22 | 2027                             | \$20,489,405   | \$20,310,696   | \$46,585,795       | 0.1662                      | -\$7,711,344                | -\$97,817,261                           |                         |
| 23 | 2028                             | \$19,622,588   | \$20,920,017   | \$47,983,369       | 0.1531                      | -\$7,547,337                | -\$105,364,598                          |                         |
| 24 | 2029                             | \$19,051,000   | \$21,547,618   | \$49,422,870       | 0.1412                      | -\$7,328,527                | -\$112,693,125                          |                         |
| 25 | 2030                             | \$18,626,778   | \$22,194,046   | \$50,905,556       | 0.1301                      | -\$7,086,576                | -\$119,779,701                          |                         |
| 26 | 2031                             | \$18,202,556   | \$22,859,867   | \$52,432,723       | 0.1199                      | -\$6,845,215                | -\$126,624,916                          |                         |
| 27 | 2032                             | \$17,778,334   | \$23,545,663   | \$54,005,704       | 0.1105                      | -\$6,605,449                | -\$133,230,365                          |                         |
| 28 | 2033                             | \$17,354,112   | \$24,252,033   | \$55,625,875       | 0.1019                      | -\$6,368,141                | -\$139,598,506                          |                         |
| 29 | 2034                             | \$16,929,890   | \$24,979,594   | \$57,294,652       | 0.0939                      | -\$6,134,027                | -\$145,732,533                          |                         |
| 30 | 2035                             | \$16,505,668   | \$25,728,982   | \$59,013,491       | 0.0865                      | -\$5,903,731                | -\$151,636,264                          |                         |
| 31 | 2036                             | \$16,081,446   | \$26,500,852   | \$60,783,896       | 0.0797                      | -\$5,677,776                | -\$157,314,040                          |                         |
| 32 | 2037                             | \$15,657,224   | \$27,295,877   | \$62,607,413       | 0.0735                      | -\$5,456,596                | -\$162,770,636                          |                         |
| 33 | 2038                             | \$15,233,002   | \$28,114,754   | \$64,485,635       | 0.0677                      | -\$5,240,546                | -\$168,011,182                          |                         |
| 34 | 2039                             | \$14,808,780   | \$28,958,196   | \$66,420,204       | 0.0624                      | -\$5,029,910                | -\$173,041,093                          |                         |
| 35 | 2040                             | \$14,384,558   | \$29,826,942   | \$68,412,810       | 0.0575                      | -\$4,824,909                | -\$177,866,002                          |                         |
| 36 | 2041                             | \$13,960,336   | \$30,721,750   | \$70,465,195       | 0.0530                      | -\$4,625,710                | -\$182,491,712                          |                         |
| 37 | 2042                             | \$13,536,114   | \$31,643,403   | \$72,579,151       | 0.0489                      | -\$4,432,432                | -\$186,924,143                          |                         |
| 38 | 2043                             | \$13,111,892   | \$32,592,705   | \$74,756,525       | 0.0450                      | -\$4,245,149                | -\$191,169,293                          |                         |
| 39 | 2044                             | \$12,687,670   | \$33,570,486   | \$76,999,221       | 0.0415                      | -\$4,063,902                | -\$195,233,194                          |                         |
| 40 | 2045                             | \$12,263,447   | \$34,577,601   | \$79,309,197       | 0.0383                      | -\$3,888,696                | -\$199,121,890                          |                         |
| 41 | 2046                             | \$11,839,225   | \$35,614,929   | \$81,688,473       | 0.0353                      | -\$3,719,510                | -\$202,841,400                          |                         |
| 42 | 2047                             | \$11,415,003   | \$36,683,376   | \$84,139,128       | 0.0325                      | -\$3,556,298                | -\$206,397,698                          |                         |
| 43 | 2048                             | \$10,990,781   | \$37,783,878   | \$86,663,301       | 0.0300                      | -\$3,398,993                | -\$209,796,690                          |                         |
| 44 | 2049                             | \$10,566,559   | \$38,917,394   | \$89,263,200       | 0.0276                      | -\$3,247,511                | -\$213,044,202                          |                         |
| 45 | 2050                             | \$10,142,337   | \$40,084,916   | \$91,941,096       | 0.0254                      | -\$3,101,754                | -\$216,145,956                          |                         |
| 46 | 2051                             | \$9,718,115  | \$41,287,463   | \$94,699,329       | 0.0235                      | -\$2,961,609                | -\$219,107,564                          |                         |
| 47 | 2052                             | \$9,293,893  | \$42,526,087   | \$97,540,309       | 0.0216                      | -\$2,826,954                | -\$221,934,518                          |                         |
| 48 | 2053                             | \$6,411,545  | \$43,801,870   | \$100,466,518      | 0.0199                      | -\$2,746,635                | -\$224,681,153                          |                         |

TABLE BM-2

## Ratepayer Cost-Benefit Analysis for Byron-North Madison Line

Quadrupling ATC's Estimated GWH Imports and Keeping Planning Reserve Margin at 18%

|    |      | Less<br>Annual<br>Revenue<br>Requirement | ATC Estimated<br>Production Savings<br>Quadrupled | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                  |
|----|------|--|---|--|--------------------|-----------------------------|-----------------------------|---|------------------|
| 1  | 2006 | \$0                                      | \$0   | \$0  | \$0                | 0.9217                      | \$0                         | \$0                                     |                  |
| 2  | 2007 | \$3,178,009                              | \$0   | \$0  | \$3,178,009        | 0.8495                      | \$2,699,577                 | \$2,699,577                             |                  |
| 3  | 2008 | \$2,994,116                              | \$0   | \$0  | \$2,994,116        | 0.7829                      | \$2,344,117                 | \$5,043,694                             |                  |
| 4  | 2009 | \$2,432,274                              | \$0   | \$0  | \$2,432,274        | 0.7216                      | \$1,755,067                 | \$6,798,761                             |                  |
| 5  | 2010 | \$534,947                                | \$0   | \$0  | \$534,947          | 0.6650                      | \$355,764                   | \$7,154,525                             |                  |
| 6  | 2011 | \$5,981,188                              | \$0   | \$0  | \$5,981,188        | 0.6129                      | \$3,666,140                 | \$10,820,664                            |                  |
| 7  | 2012 | \$16,713,730                             | \$0   | \$0  | \$16,713,730       | 0.5649                      | \$9,442,027                 | \$20,262,691                            |                  |
| 8  | 2013 | \$27,316,688                             | \$53,711,051                                      | \$0  | -\$26,394,363      | 0.5207                      | -\$13,742,739               | \$6,519,953                             | First Savings    |
| 9  | 2014 | \$31,304,879                             | \$55,322,383                                      | \$0  | -\$24,017,504      | 0.4799                      | -\$11,525,512               | -\$5,005,559                            | Break Ahead Year |
| 10 | 2015 | \$29,978,981                             | \$56,982,054                                      | \$0  | -\$27,003,074      | 0.4423                      | -\$11,943,066               | -\$16,948,625                           |                  |
| 11 | 2016 | \$28,743,001                             | \$58,691,516                                      | \$0  | -\$29,948,515      | 0.4076                      | -\$12,208,103               | -\$29,156,728                           |                  |
| 12 | 2017 | \$27,587,947                             | \$60,452,262                                      | \$0  | -\$32,864,315      | 0.3757                      | -\$12,347,178               | -\$41,503,906                           |                  |
| 13 | 2018 | \$29,632,537                             | \$62,265,829                                      | \$0  | -\$32,633,292      | 0.3463                      | -\$11,299,892               | -\$52,803,798                           |                  |
| 14 | 2019 | \$28,602,369                             | \$64,133,804                                      | \$0  | -\$35,531,435      | 0.3191                      | -\$11,339,566               | -\$64,143,364                           |                  |
| 15 | 2020 | \$27,588,686                             | \$66,057,818                                      | \$0  | -\$38,469,133      | 0.2941                      | -\$11,315,307               | -\$75,458,670                           |                  |
| 16 | 2021 | \$26,574,503                             | \$68,039,553                                      | \$0  | -\$41,465,050      | 0.2711                      | -\$11,241,037               | -\$86,699,708                           |                  |
| 17 | 2022 | \$25,560,320                             | \$70,080,740                                      | \$0  | -\$44,520,420      | 0.2499                      | -\$11,123,814               | -\$97,823,521                           |                  |
| 18 | 2023 | \$24,546,137                             | \$72,183,162                                      | \$0  | -\$47,637,025      | 0.2303                      | -\$10,970,069               | -\$108,793,590                          |                  |
| 19 | 2024 | \$23,531,954                             | \$74,348,657                                      | \$0  | -\$50,816,703      | 0.2122                      | -\$10,785,529               | -\$119,579,119                          |                  |
| 20 | 2025 | \$22,517,771                             | \$76,579,116                                      | \$0  | -\$54,061,345      | 0.1956                      | -\$10,575,285               | -\$130,154,404                          |                  |
| 21 | 2026 | \$21,503,588                             | \$78,876,490                                      | \$0  | -\$57,372,901      | 0.1803                      | -\$10,343,852               | -\$140,498,256                          |                  |
| 22 | 2027 | \$20,489,405                             | \$81,242,785                                      | \$0  | -\$60,753,379      | 0.1662                      | -\$10,095,230               | -\$150,593,486                          |                  |
| 23 | 2028 | \$19,622,588                             | \$83,680,068                                      | \$0  | -\$64,057,480      | 0.1531                      | -\$9,810,381                | -\$160,403,867                          |                  |
| 24 | 2029 | \$19,051,000                             | \$86,190,470                                      | \$0  | -\$67,139,470      | 0.1412                      | -\$9,476,854                | -\$169,880,721                          |                  |
| 25 | 2030 | \$18,626,778                             | \$88,776,184                                      | \$0  | -\$70,149,406      | 0.1301                      | -\$9,126,002                | -\$179,006,722                          |                  |
| 26 | 2031 | \$18,202,556                             | \$91,439,470                                      | \$0  | -\$73,236,913      | 0.1199                      | -\$8,781,260                | -\$187,787,982                          |                  |
| 27 | 2032 | \$17,778,334                             | \$94,182,654                                      | \$0  | -\$76,404,320      | 0.1105                      | -\$8,443,354                | -\$196,231,336                          |                  |
| 28 | 2033 | \$17,354,112                             | \$97,008,133                                      | \$0  | -\$79,654,021      | 0.1019                      | -\$8,112,880                | -\$204,344,216                          |                  |
| 29 | 2034 | \$16,929,890                             | \$99,918,377                                      | \$0  | -\$82,988,487      | 0.0939                      | -\$7,790,323                | -\$212,134,538                          |                  |
| 30 | 2035 | \$16,505,668                             | \$102,915,929                                     | \$0  | -\$86,410,261      | 0.0865                      | -\$7,476,067                | -\$219,610,605                          |                  |
| 31 | 2036 | \$16,081,446                             | \$106,003,407                                     | \$0  | -\$89,921,961      | 0.0797                      | -\$7,170,408                | -\$226,781,013                          |                  |
| 32 | 2037 | \$15,657,224                             | \$109,183,509                                     | \$0  | -\$93,526,285      | 0.0735                      | -\$6,873,565                | -\$233,654,579                          |                  |
| 33 | 2038 | \$15,233,002                             | \$112,459,014                                     | \$0  | -\$97,226,012      | 0.0677                      | -\$6,585,687                | -\$240,240,266                          |                  |
| 34 | 2039 | \$14,808,780                             | \$115,832,785                                     | \$0  | -\$101,024,005     | 0.0624                      | -\$6,306,864                | -\$246,547,130                          |                  |
| 35 | 2040 | \$14,384,558                             | \$119,307,768                                     | \$0  | -\$104,923,210     | 0.0575                      | -\$6,037,133                | -\$252,584,263                          |                  |
| 36 | 2041 | \$13,960,336                             | \$122,887,001                                     | \$0  | -\$108,926,665     | 0.0530                      | -\$5,776,485                | -\$258,360,748                          |                  |
| 37 | 2042 | \$13,536,114                             | \$126,573,611                                     | \$0  | -\$113,037,497     | 0.0489                      | -\$5,524,872                | -\$263,885,620                          |                  |
| 38 | 2043 | \$13,111,892                             | \$130,370,819                                     | \$0  | -\$117,258,928     | 0.0450                      | -\$5,282,212                | -\$269,167,832                          |                  |
| 39 | 2044 | \$12,687,670                             | \$134,281,944                                     | \$0  | -\$121,594,275     | 0.0415                      | -\$5,048,395                | -\$274,216,228                          |                  |
| 40 | 2045 | \$12,263,447                             | \$138,310,402                                     | \$0  | -\$126,046,955     | 0.0383                      | -\$4,823,284                | -\$279,039,511                          |                  |
| 41 | 2046 | \$11,839,225                             | \$142,459,714                                     | \$0  | -\$130,620,489     | 0.0353                      | -\$4,606,722                | -\$283,646,234                          |                  |
| 42 | 2047 | \$11,415,003                             | \$146,733,506                                     | \$0  | -\$135,318,503     | 0.0325                      | -\$4,398,536                | -\$288,044,770                          |                  |
| 43 | 2048 | \$10,990,781                             | \$151,135,511                                     | \$0  | -\$140,144,730     | 0.0300                      | -\$4,198,537                | -\$292,243,308                          |                  |
| 44 | 2049 | \$10,566,559                             | \$155,669,576                                     | \$0  | -\$145,103,017     | 0.0276                      | -\$4,006,526                | -\$296,249,834                          |                  |
| 45 | 2050 | \$10,142,337                             | \$160,339,664                                     | \$0  | -\$150,197,327     | 0.0254                      | -\$3,822,293                | -\$300,072,127                          |                  |
| 46 | 2051 | \$9,718,115                              | \$165,149,854                                     | \$0  | -\$155,431,739     | 0.0235                      | -\$3,645,623                | -\$303,717,750                          |                  |
| 47 | 2052 | \$9,293,893                              | \$170,104,349                                     | \$0  | -\$160,810,456     | 0.0216                      | -\$3,476,295                | -\$307,194,044                          |                  |
| 48 | 2053 | \$6,411,545                              | \$175,207,480                                     | \$0  | -\$168,795,935     | 0.0199                      | -\$3,363,059                | -\$310,557,104                          |                  |

TABLE BM-3

**Ratepayer Cost-Benefit Analysis for Byron-North Madison Line****Quadrupling ATC's Estimated Production Cost Savings and Reducing Planning Reserve Margin to 15% from 18%**

|    | Annual<br>Revenue<br>Requirement | Less<br>ATC Estimated<br>Production Savings<br>Quadrupled | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                            |
|----|----------------------------------|---|--|--------------------|-----------------------------|-----------------------------|---|----------------------------|
| 1  | 2006                             | \$0   | \$0  | \$0                | 0.9217                      | \$0                         | \$0                                     |                            |
| 2  | 2007                             | \$3,178,009   | \$0  | \$0                | 0.8495                      | \$2,699,577                 | \$2,699,577                             |                            |
| 3  | 2008                             | \$2,994,116   | \$0  | \$0                | 0.7829                      | \$2,344,117                 | \$5,043,694                             |                            |
| 4  | 2009                             | \$2,432,274   | \$0  | \$0                | 0.7216                      | \$1,755,067                 | \$6,798,761                             |                            |
| 5  | 2010                             | \$534,947   | \$0  | \$0                | 0.6650                      | \$355,764                   | \$7,154,525                             |                            |
| 6  | 2011                             | \$5,981,188   | \$0  | \$0                | 0.6129                      | \$3,666,140                 | \$10,820,664                            |                            |
| 7  | 2012                             | \$16,713,730  | \$0  | \$0                | 0.5649                      | \$9,442,027                 | \$20,262,691                            |                            |
| 8  | 2013                             | \$27,316,688  | \$53,711,051   | \$30,798,698       | 0.5207                      | -\$29,778,680               | -\$9,515,989                            | <b>First Savings &amp;</b> |
| 9  | 2014                             | \$31,304,879  | \$55,322,383   | \$31,722,659       | 0.4799                      | -\$26,748,572               | -\$36,264,560                           | <b>Break Ahead Year</b>    |
| 10 | 2015                             | \$29,978,981  | \$56,982,054   | \$32,674,339       | 0.4423                      | -\$26,394,449               | -\$62,659,010                           |                            |
| 11 | 2016                             | \$28,743,001  | \$58,691,516   | \$33,654,569       | 0.4076                      | -\$25,926,928               | -\$88,585,937                           |                            |
| 12 | 2017                             | \$27,587,947  | \$60,452,262   | \$34,664,206       | 0.3757                      | -\$25,370,579               | -\$113,956,517                          |                            |
| 13 | 2018                             | \$29,632,537  | \$62,265,829   | \$35,704,133       | 0.3463                      | -\$23,663,120               | -\$137,619,637                          |                            |
| 14 | 2019                             | \$28,602,369  | \$64,133,804   | \$36,775,257       | 0.3191                      | -\$23,076,086               | -\$160,695,724                          |                            |
| 15 | 2020                             | \$27,588,686  | \$66,057,818   | \$37,878,514       | 0.2941                      | -\$22,456,889               | -\$183,152,612                          |                            |
| 16 | 2021                             | \$26,574,503  | \$68,039,553   | \$39,014,870       | 0.2711                      | -\$21,817,839               | -\$204,970,451                          |                            |
| 17 | 2022                             | \$25,560,320  | \$70,080,740   | \$40,185,316       | 0.2499                      | -\$21,164,464               | -\$226,134,915                          |                            |
| 18 | 2023                             | \$24,546,137  | \$72,183,162   | \$41,390,875       | 0.2303                      | -\$20,501,746               | -\$246,636,660                          |                            |
| 19 | 2024                             | \$23,531,954  | \$74,348,657   | \$42,632,602       | 0.2122                      | -\$19,834,034               | -\$266,470,694                          |                            |
| 20 | 2025                             | \$22,517,771  | \$76,579,116   | \$43,911,580       | 0.1956                      | -\$19,165,110               | -\$285,635,804                          |                            |
| 21 | 2026                             | \$21,503,588  | \$78,876,490   | \$45,228,927       | 0.1803                      | -\$18,498,248               | -\$304,134,052                          |                            |
| 22 | 2027                             | \$20,489,405  | \$81,242,785   | \$46,585,795       | 0.1662                      | -\$17,836,269               | -\$321,970,321                          |                            |
| 23 | 2028                             | \$19,622,588  | \$83,680,068   | \$47,983,369       | 0.1531                      | -\$17,159,017               | -\$339,129,338                          |                            |
| 24 | 2029                             | \$19,051,000  | \$86,190,470   | \$49,422,870       | 0.1412                      | -\$16,452,979               | -\$355,582,317                          |                            |
| 25 | 2030                             | \$18,626,778  | \$88,776,184   | \$50,905,556       | 0.1301                      | -\$15,748,498               | -\$371,330,815                          |                            |
| 26 | 2031                             | \$18,202,556  | \$91,439,470   | \$52,432,723       | 0.1199                      | -\$15,068,054               | -\$386,398,869                          |                            |
| 27 | 2032                             | \$17,778,334  | \$94,182,654   | \$54,005,704       | 0.1105                      | -\$14,411,462               | -\$400,810,331                          |                            |
| 28 | 2033                             | \$17,354,112  | \$97,008,133   | \$55,625,875       | 0.1019                      | -\$13,778,457               | -\$414,588,788                          |                            |
| 29 | 2034                             | \$16,929,890  | \$99,918,377   | \$57,294,652       | 0.0939                      | -\$13,168,705               | -\$427,757,493                          |                            |
| 30 | 2035                             | \$16,505,668  | \$102,915,929  | \$59,013,491       | 0.0865                      | -\$12,581,812               | -\$440,339,305                          |                            |
| 31 | 2036                             | \$16,081,446  | \$106,003,407  | \$60,783,896       | 0.0797                      | -\$12,017,337               | -\$452,356,642                          |                            |
| 32 | 2037                             | \$15,657,224  | \$109,183,509  | \$62,607,413       | 0.0735                      | -\$11,474,797               | -\$463,831,440                          |                            |
| 33 | 2038                             | \$15,233,002  | \$112,459,014  | \$64,485,635       | 0.0677                      | -\$10,953,677               | -\$474,785,117                          |                            |
| 34 | 2039                             | \$14,808,780  | \$115,832,785  | \$66,420,204       | 0.0624                      | -\$10,453,435               | -\$485,238,552                          |                            |
| 35 | 2040                             | \$14,384,558  | \$119,307,768  | \$68,412,810       | 0.0575                      | -\$9,973,509                | -\$495,212,061                          |                            |
| 36 | 2041                             | \$13,960,336  | \$122,887,001  | \$70,465,195       | 0.0530                      | -\$9,513,321                | -\$504,725,382                          |                            |
| 37 | 2042                             | \$13,536,114  | \$126,573,611  | \$72,579,151       | 0.0489                      | -\$9,072,283                | -\$513,797,666                          |                            |
| 38 | 2043                             | \$13,111,892  | \$130,370,819  | \$74,756,525       | 0.0450                      | -\$8,649,801                | -\$522,447,467                          |                            |
| 39 | 2044                             | \$12,687,670  | \$134,281,944  | \$76,999,221       | 0.0415                      | -\$8,245,277                | -\$530,692,744                          |                            |
| 40 | 2045                             | \$12,263,447  | \$138,310,402  | \$79,309,197       | 0.0383                      | -\$7,858,112                | -\$538,550,855                          |                            |
| 41 | 2046                             | \$11,839,225  | \$142,459,714  | \$81,688,473       | 0.0353                      | -\$7,487,711                | -\$546,038,566                          |                            |
| 42 | 2047                             | \$11,415,003  | \$146,733,506  | \$84,139,128       | 0.0325                      | -\$7,133,484                | -\$553,172,050                          |                            |
| 43 | 2048                             | \$10,990,781  | \$151,135,511  | \$86,663,301       | 0.0300                      | -\$6,794,847                | -\$559,966,897                          |                            |
| 44 | 2049                             | \$10,566,559  | \$155,669,576  | \$89,263,200       | 0.0276                      | -\$6,471,225                | -\$566,438,122                          |                            |
| 45 | 2050                             | \$10,142,337  | \$160,339,664  | \$91,941,096       | 0.0254                      | -\$6,162,054                | -\$572,600,176                          |                            |
| 46 | 2051                             | \$9,718,115   | \$165,149,854  | \$94,699,329       | 0.0235                      | -\$5,866,778                | -\$578,466,955                          |                            |
| 47 | 2052                             | \$9,293,893   | \$170,104,349  | \$97,540,309       | 0.0216                      | -\$5,584,857                | -\$584,051,812                          |                            |
| 48 | 2053                             | \$6,411,545   | \$175,207,480  | \$100,466,518      | 0.0199                      | -\$5,364,736                | -\$589,416,548                          |                            |

TABLE PR-0

**Ratepayer Cost-Benefit Analysis for Paddock-Rockdale Line**  
**ATC's 606 GWH Imports Per ATC Report**

|    | Annual<br>Revenue<br>Requirement | Less<br>ATC Estimated<br>Production Savings<br>Based on 606GWH | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                         |
|----|----------------------------------|--|--|--------------------|-----------------------------|-----------------------------|---|-------------------------|
| 1  | 2006                             | \$0  | \$0  | \$0                | 0.9217                      | \$0                         | \$0                                     |                         |
| 2  | 2007                             | \$29,260   | \$0  | \$0                | 0.8495                      | \$24,855                    | \$24,855                                |                         |
| 3  | 2008                             | \$2,177,262  | \$0  | \$0                | 0.7829                      | \$1,704,596                 | \$1,729,451                             |                         |
| 4  | 2009                             | \$1,804,394  | \$0  | \$0                | 0.7216                      | \$1,302,004                 | \$3,031,456                             |                         |
| 5  | 2010                             | \$905,245  | \$0  | \$0                | 0.6650                      | \$602,029                   | \$3,633,485                             |                         |
| 6  | 2011                             | \$1,469,830  | \$0  | \$0                | 0.6129                      | \$900,925                   | \$4,534,409                             |                         |
| 7  | 2012                             | \$6,107,244  | \$0  | \$0                | 0.5649                      | \$3,450,143                 | \$7,984,552                             |                         |
| 8  | 2013                             | \$11,101,104   | \$11,400,931   | \$0                | 0.5207                      | -\$156,110                  | \$7,828,442                             |                         |
| 9  | 2014                             | \$12,855,804   | \$11,742,959   | \$0                | 0.4799                      | \$534,032                   | \$8,362,474                             |                         |
| 10 | 2015                             | \$12,313,683   | \$12,095,247   | \$0                | 0.4423                      | \$96,611                    | \$8,459,085                             |                         |
| 11 | 2016                             | \$11,808,198   | \$12,458,105   | \$0                | 0.4076                      | -\$264,926                  | \$8,194,159                             | <i>First Savings</i>    |
| 12 | 2017                             | \$11,335,683   | \$12,831,848   | \$0                | 0.3757                      | -\$562,112                  | \$7,632,047                             |                         |
| 13 | 2018                             | \$12,180,901   | \$13,216,803   | \$0                | 0.3463                      | -\$358,701                  | \$7,273,347                             |                         |
| 14 | 2019                             | \$11,759,268   | \$13,613,308   | \$0                | 0.3191                      | -\$591,701                  | \$6,681,645                             |                         |
| 15 | 2020                             | \$11,344,352   | \$14,021,707   | \$0                | 0.2941                      | -\$787,517                  | \$5,894,129                             |                         |
| 16 | 2021                             | \$10,929,233   | \$14,442,358   | \$0                | 0.2711                      | -\$952,397                  | \$4,941,732                             |                         |
| 17 | 2022                             | \$10,514,113   | \$14,875,629   | \$0                | 0.2499                      | -\$1,089,763                | \$3,851,969                             |                         |
| 18 | 2023                             | \$10,098,993   | \$15,321,898   | \$0                | 0.2303                      | -\$1,202,754                | \$2,649,215                             |                         |
| 19 | 2024                             | \$9,683,873  | \$15,781,554   | \$0                | 0.2122                      | -\$1,294,195                | \$1,355,021                             |                         |
| 20 | 2025                             | \$9,268,754  | \$16,255,001   | \$0                | 0.1956                      | -\$1,366,624                | -\$11,604                               | <i>Break Ahead Year</i> |
| 21 | 2026                             | \$8,853,634  | \$16,742,651   | \$0                | 0.1803                      | -\$1,422,324                | -\$1,433,927                            |                         |
| 22 | 2027                             | \$8,438,514  | \$17,244,931   | \$0                | 0.1662                      | -\$1,463,339                | -\$2,897,266                            |                         |
| 23 | 2028                             | \$8,083,435  | \$17,762,279   | \$0                | 0.1531                      | -\$1,482,312                | -\$4,379,578                            |                         |
| 24 | 2029                             | \$7,848,640  | \$18,295,147   | \$0                | 0.1412                      | -\$1,474,543                | -\$5,854,121                            |                         |
| 25 | 2030                             | \$7,673,886  | \$18,844,001   | \$0                | 0.1301                      | -\$1,453,163                | -\$7,307,283                            |                         |
| 26 | 2031                             | \$7,499,132  | \$19,409,321   | \$0                | 0.1199                      | -\$1,428,057                | -\$8,735,340                            |                         |
| 27 | 2032                             | \$7,324,378  | \$19,991,601   | \$0                | 0.1105                      | -\$1,399,840                | -\$10,135,180                           |                         |
| 28 | 2033                             | \$7,149,624  | \$20,591,349   | \$0                | 0.1019                      | -\$1,369,060                | -\$11,504,240                           |                         |
| 29 | 2034                             | \$6,974,869  | \$21,209,090   | \$0                | 0.0939                      | -\$1,336,199                | -\$12,840,439                           |                         |
| 30 | 2035                             | \$6,800,115  | \$21,845,362   | \$0                | 0.0865                      | -\$1,301,689                | -\$14,142,128                           |                         |
| 31 | 2036                             | \$6,625,361  | \$22,500,723   | \$0                | 0.0797                      | -\$1,265,907                | -\$15,408,035                           |                         |
| 32 | 2037                             | \$6,450,607  | \$23,175,745   | \$0                | 0.0735                      | -\$1,229,187                | -\$16,637,223                           |                         |
| 33 | 2038                             | \$6,275,852  | \$23,871,017   | \$0                | 0.0677                      | -\$1,191,824                | -\$17,829,046                           |                         |
| 34 | 2039                             | \$6,101,098  | \$24,587,148   | \$0                | 0.0624                      | -\$1,154,072                | -\$18,983,118                           |                         |
| 35 | 2040                             | \$5,926,344  | \$25,324,762   | \$0                | 0.0575                      | -\$1,116,158                | -\$20,099,276                           |                         |
| 36 | 2041                             | \$5,751,590  | \$26,084,505   | \$0                | 0.0530                      | -\$1,078,274                | -\$21,177,550                           |                         |
| 37 | 2042                             | \$5,576,835  | \$26,867,040   | \$0                | 0.0489                      | -\$1,040,590                | -\$22,218,139                           |                         |
| 38 | 2043                             | \$5,402,081  | \$27,673,051   | \$0                | 0.0450                      | -\$1,003,250                | -\$23,221,389                           |                         |
| 39 | 2044                             | \$5,227,327  | \$28,503,243   | \$0                | 0.0415                      | -\$966,378                  | -\$24,187,767                           |                         |
| 40 | 2045                             | \$5,052,573  | \$29,358,340   | \$0                | 0.0383                      | -\$930,079                  | -\$25,117,846                           |                         |
| 41 | 2046                             | \$4,877,818  | \$30,239,090   | \$0                | 0.0353                      | -\$894,441                  | -\$26,012,287                           |                         |
| 42 | 2047                             | \$4,703,064  | \$31,146,263   | \$0                | 0.0325                      | -\$859,538                  | -\$26,871,825                           |                         |
| 43 | 2048                             | \$4,528,310  | \$32,080,651   | \$0                | 0.0300                      | -\$825,429                  | -\$27,697,254                           |                         |
| 44 | 2049                             | \$4,353,556  | \$33,043,070   | \$0                | 0.0276                      | -\$792,163                  | -\$28,489,417                           |                         |
| 45 | 2050                             | \$4,178,801  | \$34,034,363   | \$0                | 0.0254                      | -\$759,779                  | -\$29,249,196                           |                         |
| 46 | 2051                             | \$4,004,047  | \$35,055,393   | \$0                | 0.0235                      | -\$728,304                  | -\$29,977,500                           |                         |
| 47 | 2052                             | \$3,829,293  | \$36,107,055   | \$0                | 0.0216                      | -\$697,759                  | -\$30,675,259                           |                         |
| 48 | 2053                             | \$2,641,937  | \$37,190,267   | \$0                | 0.0199                      | -\$688,335                  | -\$31,363,594                           |                         |

TABLE PR-1

## Ratepayer Cost-Benefit Analysis for Paddock-Rockdale Line

ATC's 606 GWH Imports and Reducing Planning Reserve Margin to 15% from 18%

|    |             | Less               | Less                  |               |                |             |               |                |                                     |
|----|-------------|--------------------|-----------------------|---------------|----------------|-------------|---------------|----------------|-------------------------------------|
|    | Annual      | ATC Estimated      | Savings From          |               | 8.50%          | 2005        | Present Value |                |                                     |
|    | Revenue     | Production Savings | Reducing Planning     | Annual        | Discount       | Discounted  | Cumulative    |                |                                     |
|    | Requirement | Based on 606GWH    | Reserve Margin to 15% | Net Cost      | Factor         | Value       | Net Cost      |                |                                     |
| 1  | 2006        | \$0                | \$0                   | \$0           | 0.9217         | \$0         | \$0           |                |                                     |
| 2  | 2007        | \$29,260           | \$0                   | \$0           | 0.8495         | \$24,855    | \$24,855      |                |                                     |
| 3  | 2008        | \$2,177,262        | \$0                   | \$0           | 0.7829         | \$1,704,596 | \$1,729,451   |                |                                     |
| 4  | 2009        | \$1,804,394        | \$0                   | \$0           | 0.7216         | \$1,302,004 | \$3,031,456   |                |                                     |
| 5  | 2010        | \$905,245          | \$0                   | \$0           | 0.6650         | \$602,029   | \$3,633,485   |                |                                     |
| 6  | 2011        | \$1,469,830        | \$0                   | \$0           | 0.6129         | \$900,925   | \$4,534,409   |                |                                     |
| 7  | 2012        | \$6,107,244        | \$0                   | \$0           | 0.5649         | \$3,450,143 | \$7,984,552   |                |                                     |
| 8  | 2013        | \$11,101,104       | \$11,400,931          | \$30,798,698  | -31,098,525    | 0.5207      | -\$16,192,052 | -\$8,207,500   | First Savings &<br>Break Ahead Year |
| 9  | 2014        | \$12,855,804       | \$11,742,959          | \$31,722,659  | -\$30,609,814  | 0.4799      | -\$14,689,028 | -\$22,896,527  |                                     |
| 10 | 2015        | \$12,313,683       | \$12,095,247          | \$32,674,339  | -\$32,455,903  | 0.4423      | -\$14,354,773 | -\$37,251,300  |                                     |
| 11 | 2016        | \$11,808,198       | \$12,458,105          | \$33,654,569  | -\$34,304,476  | 0.4076      | -\$13,983,751 | -\$51,235,051  |                                     |
| 12 | 2017        | \$11,335,683       | \$12,831,848          | \$34,664,206  | -\$36,160,371  | 0.3757      | -\$13,585,512 | -\$64,820,563  |                                     |
| 13 | 2018        | \$12,180,901       | \$13,216,803          | \$35,704,133  | -\$36,740,035  | 0.3463      | -\$12,721,929 | -\$77,542,492  |                                     |
| 14 | 2019        | \$11,759,268       | \$13,613,308          | \$36,775,257  | -\$38,629,296  | 0.3191      | -\$12,328,222 | -\$89,870,714  |                                     |
| 15 | 2020        | \$11,344,352       | \$14,021,707          | \$37,878,514  | -\$40,555,869  | 0.2941      | -\$11,929,099 | -\$101,799,813 |                                     |
| 16 | 2021        | \$10,929,233       | \$14,442,358          | \$39,014,870  | -\$42,527,995  | 0.2711      | -\$11,529,198 | -\$113,329,011 |                                     |
| 17 | 2022        | \$10,514,113       | \$14,875,629          | \$40,185,316  | -\$44,546,832  | 0.2499      | -\$11,130,413 | -\$124,459,424 |                                     |
| 18 | 2023        | \$10,098,993       | \$15,321,898          | \$41,390,875  | -\$46,613,780  | 0.2303      | -\$10,734,431 | -\$135,193,855 |                                     |
| 19 | 2024        | \$9,683,873        | \$15,781,554          | \$42,632,602  | -\$48,730,283  | 0.2122      | -\$10,342,699 | -\$145,536,555 |                                     |
| 20 | 2025        | \$9,268,754        | \$16,255,001          | \$43,911,580  | -\$50,897,827  | 0.1956      | -\$9,956,449  | -\$155,493,004 |                                     |
| 21 | 2026        | \$8,853,634        | \$16,742,651          | \$45,228,927  | -\$53,117,944  | 0.1803      | -\$9,576,719  | -\$165,069,723 |                                     |
| 22 | 2027        | \$8,438,514        | \$17,244,931          | \$46,585,795  | -\$55,392,211  | 0.1662      | -\$9,204,378  | -\$174,274,101 |                                     |
| 23 | 2028        | \$8,083,435        | \$17,762,279          | \$47,983,369  | -\$57,662,212  | 0.1531      | -\$8,830,948  | -\$183,105,049 |                                     |
| 24 | 2029        | \$7,848,640        | \$18,295,147          | \$49,422,870  | -\$59,869,376  | 0.1412      | -\$8,450,668  | -\$191,555,717 |                                     |
| 25 | 2030        | \$7,673,886        | \$18,844,001          | \$50,905,556  | -\$62,075,671  | 0.1301      | -\$8,075,659  | -\$199,631,376 |                                     |
| 26 | 2031        | \$7,499,132        | \$19,409,321          | \$52,432,723  | -\$64,342,912  | 0.1199      | -\$7,714,851  | -\$207,346,226 |                                     |
| 27 | 2032        | \$7,324,378        | \$19,991,601          | \$54,005,704  | -\$66,672,928  | 0.1105      | -\$7,367,949  | -\$214,714,175 |                                     |
| 28 | 2033        | \$7,149,624        | \$20,591,349          | \$55,625,875  | -\$69,067,601  | 0.1019      | -\$7,034,637  | -\$221,748,812 |                                     |
| 29 | 2034        | \$6,974,869        | \$21,209,090          | \$57,294,652  | -\$71,528,872  | 0.0939      | -\$6,714,582  | -\$228,463,394 |                                     |
| 30 | 2035        | \$6,800,115        | \$21,845,362          | \$59,013,491  | -\$74,058,738  | 0.0865      | -\$6,407,434  | -\$234,870,828 |                                     |
| 31 | 2036        | \$6,625,361        | \$22,500,723          | \$60,783,896  | -\$76,659,258  | 0.0797      | -\$6,112,836  | -\$240,983,664 |                                     |
| 32 | 2037        | \$6,450,607        | \$23,175,745          | \$62,607,413  | -\$79,332,551  | 0.0735      | -\$5,830,419  | -\$246,814,083 |                                     |
| 33 | 2038        | \$6,275,852        | \$23,871,017          | \$64,485,635  | -\$82,080,800  | 0.0677      | -\$5,559,813  | -\$252,373,897 |                                     |
| 34 | 2039        | \$6,101,098        | \$24,587,148          | \$66,420,204  | -\$84,906,254  | 0.0624      | -\$5,300,643  | -\$257,674,540 |                                     |
| 35 | 2040        | \$5,926,344        | \$25,324,762          | \$68,412,810  | -\$87,811,229  | 0.0575      | -\$5,052,534  | -\$262,727,074 |                                     |
| 36 | 2041        | \$5,751,590        | \$26,084,505          | \$70,465,195  | -\$90,798,110  | 0.0530      | -\$4,815,110  | -\$267,542,184 |                                     |
| 37 | 2042        | \$5,576,835        | \$26,867,040          | \$72,579,151  | -\$93,869,355  | 0.0489      | -\$4,588,001  | -\$272,130,185 |                                     |
| 38 | 2043        | \$5,402,081        | \$27,673,051          | \$74,756,525  | -\$97,027,495  | 0.0450      | -\$4,370,839  | -\$276,501,024 |                                     |
| 39 | 2044        | \$5,227,327        | \$28,503,243          | \$76,999,221  | -\$100,275,137 | 0.0415      | -\$4,163,259  | -\$280,664,283 |                                     |
| 40 | 2045        | \$5,052,573        | \$29,358,340          | \$79,309,197  | -\$103,614,965 | 0.0383      | -\$3,964,907  | -\$284,629,190 |                                     |
| 41 | 2046        | \$4,877,818        | \$30,239,090          | \$81,688,473  | -\$107,049,745 | 0.0353      | -\$3,775,430  | -\$288,404,619 |                                     |
| 42 | 2047        | \$4,703,064        | \$31,146,263          | \$84,139,128  | -\$110,582,326 | 0.0325      | -\$3,594,485  | -\$291,999,105 |                                     |
| 43 | 2048        | \$4,528,310        | \$32,080,651          | \$86,663,301  | -\$114,215,642 | 0.0300      | -\$3,421,739  | -\$295,420,844 |                                     |
| 44 | 2049        | \$4,353,556        | \$33,043,070          | \$89,263,200  | -\$117,952,715 | 0.0276      | -\$3,256,863  | -\$298,677,706 |                                     |
| 45 | 2050        | \$4,178,801        | \$34,034,363          | \$91,941,096  | -\$121,796,658 | 0.0254      | -\$3,099,539  | -\$301,777,246 |                                     |
| 46 | 2051        | \$4,004,047        | \$35,055,393          | \$94,699,329  | -\$125,750,676 | 0.0235      | -\$2,949,459  | -\$304,726,705 |                                     |
| 47 | 2052        | \$3,829,293        | \$36,107,055          | \$97,540,309  | -\$129,818,072 | 0.0216      | -\$2,806,322  | -\$307,533,026 |                                     |
| 48 | 2053        | \$2,641,937        | \$37,190,267          | \$100,466,518 | -\$135,014,848 | 0.0199      | -\$2,690,011  | -\$310,223,038 |                                     |

TABLE PR-2

**Ratepayer Cost-Benefit Analysis for Paddock-Rockdale Line**  
**Quadrupling ATC's Estimated GWH Imports and Keeping Planning Reserve Margin at 18%**

|    | Annual<br>Revenue<br>Requirement | Less<br>ATC Estimated<br>Production Savings<br>Quadrupled | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                            |
|----|----------------------------------|---|--|--------------------|-----------------------------|-----------------------------|---|----------------------------|
| 1  | 2006                             | \$0   | \$0  | \$0                | 0.9217                      | \$0                         | \$0                                     |                            |
| 2  | 2007                             | \$29,260  | \$0  | \$0                | 0.8495                      | \$24,855                    | \$24,855                                |                            |
| 3  | 2008                             | \$2,177,262   | \$0  | \$0                | 0.7829                      | \$1,704,596                 | \$1,729,451                             |                            |
| 4  | 2009                             | \$1,804,394   | \$0  | \$0                | 0.7216                      | \$1,302,004                 | \$3,031,456                             |                            |
| 5  | 2010                             | \$905,245   | \$0  | \$0                | 0.6650                      | \$602,029                   | \$3,633,485                             |                            |
| 6  | 2011                             | \$1,469,830   | \$0  | \$0                | 0.6129                      | \$900,925                   | \$4,534,409                             |                            |
| 7  | 2012                             | \$6,107,244   | \$0  | \$0                | 0.5649                      | \$3,450,143                 | \$7,984,552                             |                            |
| 8  | 2013                             | \$11,101,104  | \$45,603,723   | \$0                | 0.5207                      | -\$17,964,459               | -\$9,979,907                            | <b>First Savings &amp;</b> |
| 9  | 2014                             | \$12,855,804  | \$46,971,835   | \$0                | 0.4799                      | -\$16,371,590               | -\$26,351,497                           | <b>Break Ahead Year</b>    |
| 10 | 2015                             | \$12,313,683  | \$48,380,990   | \$0                | 0.4423                      | -\$15,952,043               | -\$42,303,540                           |                            |
| 11 | 2016                             | \$11,808,198  | \$49,832,419   | \$0                | 0.4076                      | -\$15,500,054               | -\$57,803,594                           |                            |
| 12 | 2017                             | \$11,335,683  | \$51,327,392   | \$0                | 0.3757                      | -\$15,024,952               | -\$72,828,547                           |                            |
| 13 | 2018                             | \$12,180,901  | \$52,867,214   | \$0                | 0.3463                      | -\$14,088,402               | -\$86,916,949                           |                            |
| 14 | 2019                             | \$11,759,268  | \$54,453,230   | \$0                | 0.3191                      | -\$13,625,427               | -\$100,542,376                          |                            |
| 15 | 2020                             | \$11,344,352  | \$56,086,827   | \$0                | 0.2941                      | -\$13,160,547               | -\$113,702,922                          |                            |
| 16 | 2021                             | \$10,929,233  | \$57,769,432   | \$0                | 0.2711                      | -\$12,698,222               | -\$126,401,144                          |                            |
| 17 | 2022                             | \$10,514,113  | \$59,502,515   | \$0                | 0.2499                      | -\$12,240,178               | -\$138,641,322                          |                            |
| 18 | 2023                             | \$10,098,993  | \$61,287,590   | \$0                | 0.2303                      | -\$11,787,941               | -\$150,429,263                          |                            |
| 19 | 2024                             | \$9,683,873   | \$63,126,218   | \$0                | 0.2122                      | -\$11,342,805               | -\$161,772,068                          |                            |
| 20 | 2025                             | \$9,268,754   | \$65,020,004   | \$0                | 0.1956                      | -\$10,905,858               | -\$172,677,926                          |                            |
| 21 | 2026                             | \$8,853,634   | \$66,970,605   | \$0                | 0.1803                      | -\$10,478,002               | -\$183,155,928                          |                            |
| 22 | 2027                             | \$8,438,514   | \$68,979,723   | \$0                | 0.1662                      | -\$10,059,974               | -\$193,215,902                          |                            |
| 23 | 2028                             | \$8,083,435   | \$71,049,114   | \$0                | 0.1531                      | -\$9,643,172                | -\$202,859,074                          |                            |
| 24 | 2029                             | \$7,848,640   | \$73,180,588   | \$0                | 0.1412                      | -\$9,221,719                | -\$212,080,793                          |                            |
| 25 | 2030                             | \$7,673,886   | \$75,376,005   | \$0                | 0.1301                      | -\$8,807,625                | -\$220,888,418                          |                            |
| 26 | 2031                             | \$7,499,132   | \$77,637,286   | \$0                | 0.1199                      | -\$8,409,712                | -\$229,298,130                          |                            |
| 27 | 2032                             | \$7,324,378   | \$79,966,404   | \$0                | 0.1105                      | -\$8,027,587                | -\$237,325,717                          |                            |
| 28 | 2033                             | \$7,149,624   | \$82,365,396   | \$0                | 0.1019                      | -\$7,660,838                | -\$244,986,555                          |                            |
| 29 | 2034                             | \$6,974,869   | \$84,836,358   | \$0                | 0.0939                      | -\$7,309,039                | -\$252,295,594                          |                            |
| 30 | 2035                             | \$6,800,115   | \$87,381,449   | \$0                | 0.0865                      | -\$6,971,758                | -\$259,267,352                          |                            |
| 31 | 2036                             | \$6,625,361   | \$90,002,892   | \$0                | 0.0797                      | -\$6,648,553                | -\$265,915,905                          |                            |
| 32 | 2037                             | \$6,450,607   | \$92,702,979   | \$0                | 0.0735                      | -\$6,338,981                | -\$272,254,886                          |                            |
| 33 | 2038                             | \$6,275,852   | \$95,484,069   | \$0                | 0.0677                      | -\$6,042,595                | -\$278,297,481                          |                            |
| 34 | 2039                             | \$6,101,098   | \$98,348,591   | \$0                | 0.0624                      | -\$5,758,952                | -\$284,056,433                          |                            |
| 35 | 2040                             | \$5,926,344   | \$101,299,048  | \$0                | 0.0575                      | -\$5,487,610                | -\$289,544,043                          |                            |
| 36 | 2041                             | \$5,751,590   | \$104,338,020  | \$0                | 0.0530                      | -\$5,228,132                | -\$294,772,176                          |                            |
| 37 | 2042                             | \$5,576,835   | \$107,468,160  | \$0                | 0.0489                      | -\$4,980,087                | -\$299,752,262                          |                            |
| 38 | 2043                             | \$5,402,081   | \$110,692,205  | \$0                | 0.0450                      | -\$4,743,049                | -\$304,495,311                          |                            |
| 39 | 2044                             | \$5,227,327   | \$114,012,971  | \$0                | 0.0415                      | -\$4,516,602                | -\$309,011,913                          |                            |
| 40 | 2045                             | \$5,052,573   | \$117,433,361  | \$0                | 0.0383                      | -\$4,300,338                | -\$313,312,250                          |                            |
| 41 | 2046                             | \$4,877,818   | \$120,956,361  | \$0                | 0.0353                      | -\$4,093,857                | -\$317,406,107                          |                            |
| 42 | 2047                             | \$4,703,064   | \$124,585,052  | \$0                | 0.0325                      | -\$3,896,771                | -\$321,302,879                          |                            |
| 43 | 2048                             | \$4,528,310   | \$128,322,604  | \$0                | 0.0300                      | -\$3,708,702                | -\$325,011,580                          |                            |
| 44 | 2049                             | \$4,353,556   | \$132,172,282  | \$0                | 0.0276                      | -\$3,529,279                | -\$328,540,860                          |                            |
| 45 | 2050                             | \$4,178,801   | \$136,137,450  | \$0                | 0.0254                      | -\$3,358,147                | -\$331,899,006                          |                            |
| 46 | 2051                             | \$4,004,047   | \$140,221,574  | \$0                | 0.0235                      | -\$3,194,957                | -\$335,093,963                          |                            |
| 47 | 2052                             | \$3,829,293   | \$144,428,221  | \$0                | 0.0216                      | -\$3,039,375                | -\$338,133,338                          |                            |
| 48 | 2053                             | \$2,641,937   | \$148,761,068  | \$0                | 0.0199                      | -\$2,911,251                | -\$341,044,589                          |                            |



TABLE PR-3

**Ratepayer Cost-Benefit Analysis for Paddock-Rockdale Line****Quadrupling ATC's Estimated Production Cost Savings and Reducing Planning Reserve Margin to 15% from 18%**

|    |      | Less<br>ATC Estimated<br>Production Savings<br>Quadrupled | Less<br>Savings From<br>Reducing Planning<br>Reserve Margin to 15% | Annual<br>Net Cost | 8.50%<br>Discount<br>Factor | 2005<br>Discounted<br>Value | Present Value<br>Cumulative<br>Net Cost |                            |
|----|------|---|--|--------------------|-----------------------------|-----------------------------|---|----------------------------|
| 1  | 2006 | \$0   | \$0  | \$0                | 0.9217                      | \$0                         | \$0                                     |                            |
| 2  | 2007 | \$29,260  | \$0  | \$0                | 0.8495                      | \$24,855                    | \$24,855                                |                            |
| 3  | 2008 | \$2,177,262   | \$0  | \$0                | 0.7829                      | \$1,704,596                 | \$1,729,451                             |                            |
| 4  | 2009 | \$1,804,394   | \$0  | \$0                | 0.7216                      | \$1,302,004                 | \$3,031,456                             |                            |
| 5  | 2010 | \$905,245   | \$0  | \$0                | 0.6650                      | \$602,029                   | \$3,633,485                             |                            |
| 6  | 2011 | \$1,469,830   | \$0  | \$0                | 0.6129                      | \$900,925                   | \$4,534,409                             |                            |
| 7  | 2012 | \$6,107,244   | \$0  | \$0                | 0.5649                      | \$3,450,143                 | \$7,984,552                             |                            |
| 8  | 2013 | \$11,101,104  | \$45,603,723   | \$30,798,698       | 0.5207                      | -\$34,000,401               | -\$26,015,848                           | <b>First Savings &amp;</b> |
| 9  | 2014 | \$12,855,804  | \$46,971,835   | \$31,722,659       | 0.4799                      | -\$31,594,649               | -\$57,610,498                           | <b>Break Ahead Year</b>    |
| 10 | 2015 | \$12,313,683  | \$48,380,990   | \$32,674,339       | 0.4423                      | -\$30,403,427               | -\$88,013,925                           |                            |
| 11 | 2016 | \$11,808,198  | \$49,832,419   | \$33,654,569       | 0.4076                      | -\$29,218,879               | -\$117,232,804                          |                            |
| 12 | 2017 | \$11,335,683  | \$51,327,392   | \$34,664,206       | 0.3757                      | -\$28,048,353               | -\$145,281,157                          |                            |
| 13 | 2018 | \$12,180,901  | \$52,867,214   | \$35,704,133       | 0.3463                      | -\$26,451,630               | -\$171,732,787                          |                            |
| 14 | 2019 | \$11,759,268  | \$54,453,230   | \$36,775,257       | 0.3191                      | -\$25,361,948               | -\$197,094,735                          |                            |
| 15 | 2020 | \$11,344,352  | \$56,086,827   | \$37,878,514       | 0.2941                      | -\$24,302,129               | -\$221,396,864                          |                            |
| 16 | 2021 | \$10,929,233  | \$57,769,432   | \$39,014,870       | 0.2711                      | -\$23,275,024               | -\$244,671,888                          |                            |
| 17 | 2022 | \$10,514,113  | \$59,502,515   | \$40,185,316       | 0.2499                      | -\$22,280,828               | -\$266,952,716                          |                            |
| 18 | 2023 | \$10,098,993  | \$61,287,590   | \$41,390,875       | 0.2303                      | -\$21,319,618               | -\$288,272,333                          |                            |
| 19 | 2024 | \$9,683,873   | \$63,126,218   | \$42,632,602       | 0.2122                      | -\$20,391,310               | -\$308,663,643                          |                            |
| 20 | 2025 | \$9,268,754   | \$65,020,004   | \$43,911,580       | 0.1956                      | -\$19,495,683               | -\$328,159,326                          |                            |
| 21 | 2026 | \$8,853,634   | \$66,970,605   | \$45,228,927       | 0.1803                      | -\$18,632,397               | -\$346,791,724                          |                            |
| 22 | 2027 | \$8,438,514   | \$68,979,723   | \$46,585,795       | 0.1662                      | -\$17,801,013               | -\$364,592,737                          |                            |
| 23 | 2028 | \$8,083,435   | \$71,049,114   | \$47,983,369       | 0.1531                      | -\$16,991,808               | -\$381,584,545                          |                            |
| 24 | 2029 | \$7,848,640   | \$73,180,588   | \$49,422,870       | 0.1412                      | -\$16,197,844               | -\$397,782,389                          |                            |
| 25 | 2030 | \$7,673,886   | \$75,376,005   | \$50,905,556       | 0.1301                      | -\$15,430,121               | -\$413,212,510                          |                            |
| 26 | 2031 | \$7,499,132   | \$77,637,286   | \$52,432,723       | 0.1199                      | -\$14,696,506               | -\$427,909,016                          |                            |
| 27 | 2032 | \$7,324,378   | \$79,966,404   | \$54,005,704       | 0.1105                      | -\$13,995,695               | -\$441,904,711                          |                            |
| 28 | 2033 | \$7,149,624   | \$82,365,396   | \$55,625,875       | 0.1019                      | -\$13,326,415               | -\$455,231,127                          |                            |
| 29 | 2034 | \$6,974,869   | \$84,836,358   | \$57,294,652       | 0.0939                      | -\$12,687,422               | -\$467,918,548                          |                            |
| 30 | 2035 | \$6,800,115   | \$87,381,449   | \$59,013,491       | 0.0865                      | -\$12,077,504               | -\$479,996,052                          |                            |
| 31 | 2036 | \$6,625,361   | \$90,002,892   | \$60,783,896       | 0.0797                      | -\$11,495,482               | -\$491,491,534                          |                            |
| 32 | 2037 | \$6,450,607   | \$92,702,979   | \$62,607,413       | 0.0735                      | -\$10,940,213               | -\$502,431,747                          |                            |
| 33 | 2038 | \$6,275,852   | \$95,484,069   | \$64,485,635       | 0.0677                      | -\$10,410,585               | -\$512,842,332                          |                            |
| 34 | 2039 | \$6,101,098   | \$98,348,591   | \$66,420,204       | 0.0624                      | -\$9,905,523                | -\$522,747,855                          |                            |
| 35 | 2040 | \$5,926,344   | \$101,299,048  | \$68,412,810       | 0.0575                      | -\$9,423,986                | -\$532,171,841                          |                            |
| 36 | 2041 | \$5,751,590   | \$104,338,020  | \$70,465,195       | 0.0530                      | -\$8,964,969                | -\$541,136,810                          |                            |
| 37 | 2042 | \$5,576,835   | \$107,468,160  | \$72,579,151       | 0.0489                      | -\$8,527,498                | -\$549,664,308                          |                            |
| 38 | 2043 | \$5,402,081   | \$110,692,205  | \$74,756,525       | 0.0450                      | -\$8,110,638                | -\$557,774,946                          |                            |
| 39 | 2044 | \$5,227,327   | \$114,012,971  | \$76,999,221       | 0.0415                      | -\$7,713,483                | -\$565,488,429                          |                            |
| 40 | 2045 | \$5,052,573   | \$117,433,361  | \$79,309,197       | 0.0383                      | -\$7,335,165                | -\$572,823,594                          |                            |
| 41 | 2046 | \$4,877,818   | \$120,956,361  | \$81,688,473       | 0.0353                      | -\$6,974,846                | -\$579,798,440                          |                            |
| 42 | 2047 | \$4,703,064   | \$124,585,052  | \$84,139,128       | 0.0325                      | -\$6,631,719                | -\$586,430,159                          |                            |
| 43 | 2048 | \$4,528,310   | \$128,322,604  | \$86,663,301       | 0.0300                      | -\$6,305,011                | -\$592,735,170                          |                            |
| 44 | 2049 | \$4,353,556   | \$132,172,282  | \$89,263,200       | 0.0276                      | -\$5,993,979                | -\$598,729,148                          |                            |
| 45 | 2050 | \$4,178,801   | \$136,137,450  | \$91,941,096       | 0.0254                      | -\$5,697,907                | -\$604,427,056                          |                            |
| 46 | 2051 | \$4,004,047   | \$140,221,574  | \$94,699,329       | 0.0235                      | -\$5,416,113                | -\$609,843,168                          |                            |
| 47 | 2052 | \$3,829,293   | \$144,428,221  | \$97,540,309       | 0.0216                      | -\$5,147,937                | -\$614,991,106                          |                            |
| 48 | 2053 | \$2,641,937   | \$148,761,068  | \$100,466,518      | 0.0199                      | -\$4,912,928                | -\$619,904,033                          |                            |

## Glossary of Terms

|       |  |
|-------|--|
| ASI   | Access Study Initiative  |
| ATC   | American Transmission Company, LLC   |
| CPCN  | Certificate of Public Convenience and Necessity  |
| DNR   | Designated Network Resource  |
| EHV   | Extra High Voltage (345 kV for purposes of this docket)  |
| EPAct | Energy Policy Act  |
| FERC  | Federal Energy Regulatory Commission   |
| FTR   | Financial Transmission Rights, a financial instrument that entitles the holder to compensation for certain congestion-related transmission charges   |
| IPP   | Independent Power Producer   |
| ISIS  | MISO's Interconnection System Impact Study   |
| LMP   | Locational Marginal Pricing, the idea that the market price of a commodity should be the cost of bringing the last unit of that commodity, the one that balances supply and demand, to the market. |
| LOLE  | Loss of Load Expectation, the expected number of days in the year when the daily peak demand exceeds the available generating capacity.  |
| LSE   | Load Serving Entity  |
| n-1   | A check to ensure that unexpected loss of one element of the transmission system does not overload any other element.  |
| MISO  | Midwest Independent Transmission System Operator   |
| MTEP  | Midwest Transmission Expansion Plan  |
| OMS   | Organization of Midwest States, regulators in the MISO footprint   |
| RECB  | Regional Expansion Criteria and Benefits, a cost sharing methodology   |
| ROW   | Right-of-way   |
| RTO   | Regional Transmission Organization   |
| SEA   | Public Service Commission of Wisconsin's Strategic Energy Assessment   |
| WUMS  | Wisconsin Upper Michigan System  |

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